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MARCH, 1955

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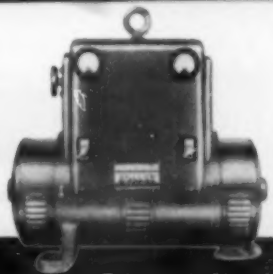

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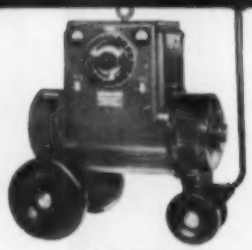

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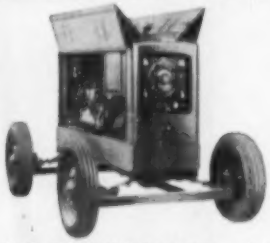
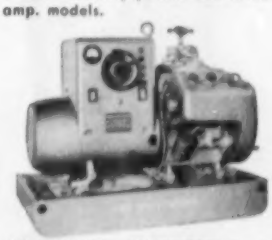


GAS DRIVE WELDERS with 1, 3, or 12 KW auxiliary power. 200 to 600 amp. models.



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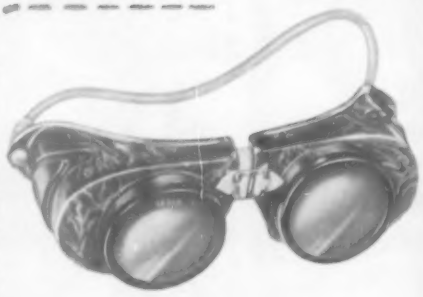

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Welding Engineer

March, 1955
Vol. 40—No. 3

A MAGAZINE OF JOINING AND SEVERING OF METALS

America's pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1898

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CONVENTION

IAA heads for Houston 23
Western Metal Congress in LA 35
Midwest welding conference 46

OPERATION

How to arc weld the different types of stainless steels—II 32
Lester F. Spencer
Filler metals for joining 40
Orville T. Barnett
New tube tester 43
Bill Brotherton

FABRICATION

Welded toll gates 28
Walter Palmer
Mig and Tig welding have teamed up 30
George Kotcher

MAINTENANCE

Flame-straightening bent beams 24
Herman C. Phelps
How a Yankee braze welds 26

CONSTRUCTION

World's largest girders for new cantilever bridge 38
Herman C. Phelps
Tubular-steel construction 50
Walter Sekules

INSPECTION

One key to B&W's success 36
David Goodman

DEPARTMENTS

News 5
Letters to the editor 10
Editorial: Welding and wonders of the U. S. 21
The welding clinic—introducing a new department 44
Data Sheet No. 174: Coated nickel electrodes 49
On the job 52
New products 54
People 88
Book reviews 94
30 years ago 96
Patents 97
Where to buy 98
Advertisers in this issue 98
The Welding Shopper 99
Free literature 100
Welding Info-Aids 101
Literature offered in ads 102

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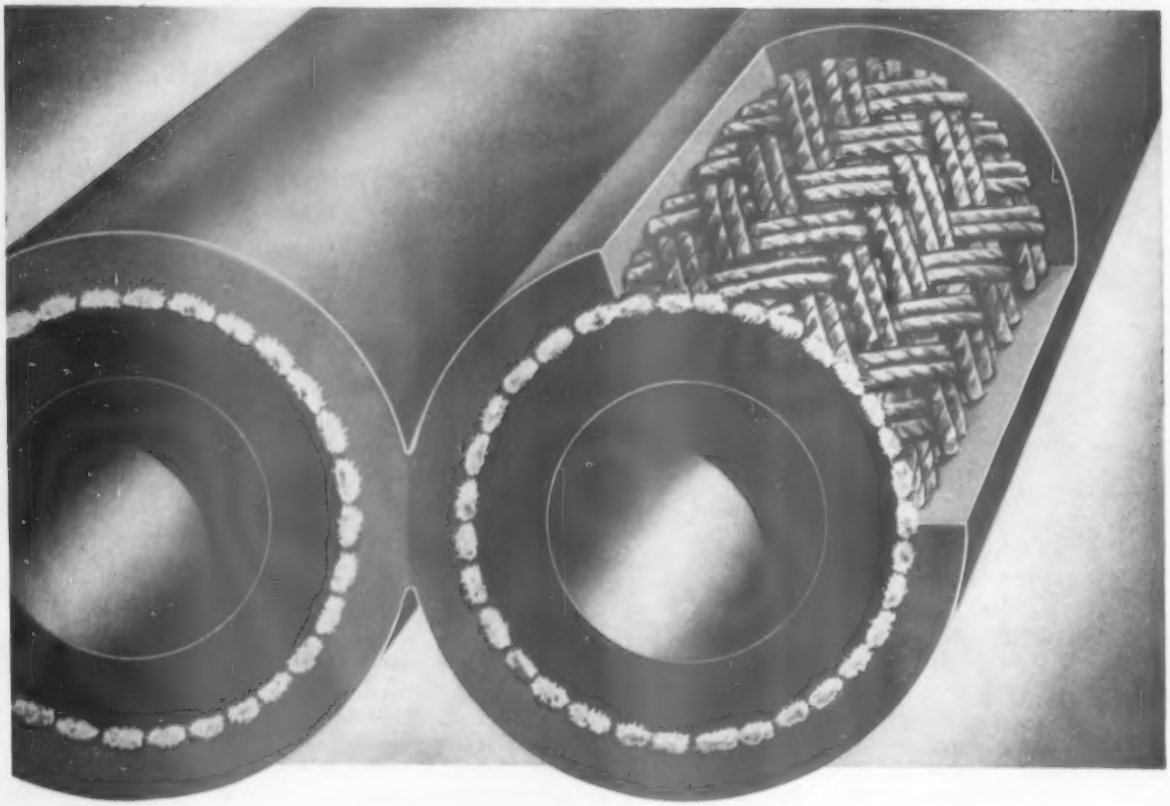

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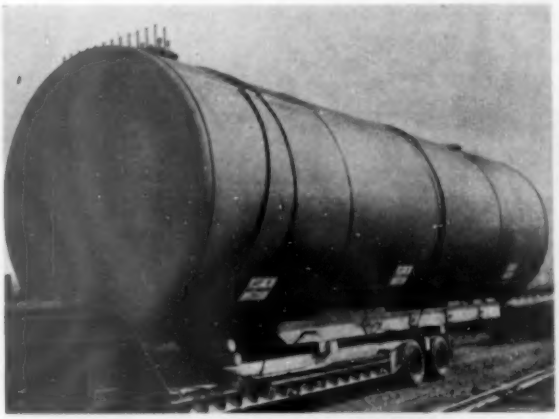

—Continental Copper and Steel Industries, Inc.

GIANT-sized storage tank is one of four produced for federal government project in Idaho Falls, Idaho. Each tank, shop fabricated for shipment in one piece, has 11-ft 6-in. diameter, is 38 ft on the straight shell and weighs approximately 50,000 lb. Every inch of welding was X-rayed

—Courtesy Williams and Co., Inc.

NEW warehouse at Toledo was scene of open house and welding show. Specialists of 35 companies discussed and demonstrated latest developments in products and techniques. This plant was added to give additional service in the area

NEWS

NWSA invites foreign distributors to convention

Distributors of welding equipment and supplies from outside the United States and Canada have been extended invitations to attend the National Welding Supply Association's 11th annual convention which will be held in Chicago from May 18 through 20.

NWSA Vice-President E. C. Caluwaert, convention chairman, feels the annual meeting will provide a good opportunity for distributors in foreign countries to form personal contacts with the various firms they represent, as well as acquaint themselves with welding distributors of this country.

Convention headquarters will be Chicago's Edgewater Beach Hotel, on the north side's lake front.

* * *

New resistance-welding firm formed in Detroit

Formation of the Delta Welder Corp. in Detroit was recently announced. Harry E. Day, formerly vice-president and general manager of Link Welder Corp., Detroit, was named president. Glenn Cashdollar, formerly executive vice-president of Link Welder, is vice-president, and Arthur Zebedee is secretary-treasurer.

Delta will be concerned with the design, engineering, and building of completely automatic multiple-point welding machines. Production will also include special units such as portable welding guns, spot, butt, seam, flash, projection and resistance upsetting welders. The plant and executive offices are located at 8525 Liverqois.

* * *

Carborundum purchases Curtis Machine Corp.

The Carborundum Co., Niagara Falls, N. Y., has acquired Curtis Machine Corp., Jamestown, N. Y. A pioneer in the manufacture of rubbing machinery for the furniture industry, Curtis has developed many types of abrasive belt grinding machines for the metal industry. Carborundum Co. produces over 20,000 types of coated abrasives each year.

Mr. DeMambro, president and general manager of Curtis Machine since 1946, wil continue in that capacity.

* * *

Engineering conference April 18-19 in Kansas City

The seventh annual National Engineering Conference of the American Institute of Steel Construction will be held at the Hotel Muehlebach, Kansas City, Mo., Monday and Tuesday, April 18-19.

Williams opens new warehouse with metal and welding show

An open house and welding show was recently held by Williams and Co., Inc. in its new warehouse at 946 Kane St., Toledo, Ohio. More than 1,500 persons visited the modern 40,000 sq ft plant to see the latest in products and methods of 35 manufacturers of metal and welding equipment. Films illustrating the use of welding and brazing were shown at scheduled intervals.

Organized in Pittsburgh, Pa., in 1907, Williams and Co. now operates six warehouses. In addition to Pittsburgh and Toledo, warehouses are located in Cleveland, Columbus, Cincinnati and Louisville.

Harold E. Williams, founder, is chairman of the board and still active in the company. George J. Schmitt is district manager of the Toledo branch.

* * *

Lincoln Foundation sponsors machine tool design award

Sponsorship of a $12,000 Machine Tool Design Award program has been announced by The James F. Lincoln Arc Welding Foundation, Cleveland. Awards are to be made for papers describing the use of arc welding in machine tool design.

The Foundation hopes such a program will be of service in stimulating creative engineering. It is open to all persons who are or have been engaged in the design or making of metal-cutting or metal-forming machine tools. Fifteen awards will be given. Closing date is July 15. A booket giving full details is available from the Foundation.

NEWS

from page 5

—Courtesy Linde Air Products Co.

ACETYLENE flame-cutting machine slices 18 by 108 by 65-in. section of king-sized carbon steel forging at Isaacson Iron Works, Seattle. Rectangular-shaped slab was one of several in rush order for Hanford Atomic Energy Plant. Total linear cut of 346 in. on each of the slabs, through 18 in. depth, took less than two hours. Templet tracer guided cutting action

—Courtesy Dravo Corp.

NEW 98-ton miter gate for the upsteam end of the main lock of Locks No. 26 on the Mississippi River at Alton, Ill. near St. Louis is lifted aboard tandem barges at Dravo's Corp.'s shipyard, Pittsburgh. Each gate leaf, fabricated of welded steel, is 60½ ft. long by approximately 30 ft. high

Welding and finishing show in Miami

A welding and finishing clinic will be presented by Florida Metals, Inc., at its Miami warehouse, 3690 N. W. 52nd St., Miami, Fla., from 1 p.m. to 9 p.m. March 23-25.

Metallurgists and welding engineers from The Aluminum Co. of America, Crucible Steel Co., Revere Copper and Brass, Inc., as well as welding engineers from several leading welding equipment and supply manufacturers will hold continuous demonstrations. They will also answer questions concerning various methods of welding and brazing corrosion-resistant metals, including aluminum, brass, bronze, copper, stainless steel and titanium.

Films illustrating industrial applications of welding and brazing will be shown at regular intervals throughout the show, which will be held in a new 15,000-sq-ft addition to the warehouse. This addition will give Florida Metals a total of 37,000 sq ft of warehouse space in Miami. The company also maintains plants for warehousing metals in Jacksonville and Tampa.

* * *

Air Reduction technical paper wins AIEE award

Second prize in the Industrial Division was awarded by The American Institute of Electrical Engineering to W. J. Greene, assistant director of metallurgical research, and Dr. A. Muller, director of metallurgical research, of the Research Laboratories, Murray Hill, N. J. of Air Reduction Co., Inc.

The paper entitled, "Atomic Film Cathode in Inert Gas Shielded Metal Arcs," details Air Reduction's developmental work in the field of emissive coated wires for the Mig (metal inert-gas) welding process. The award was presented during the AIEE's recent general winter meeting in New York City.

* * *

Welding engineering scholarship awarded to William F. Brown

The 1954-55 Welding Engineering scholarship of $150 was awarded to William F. Brown, a senior in Ohio State University's College of Engineering. A student in welding engineering, Mr. Brown accumulated his qualifying high grade average while earning three-fourths of his college expenses during his first three years and all his expenses during the current year.

The scholarship fund was established in 1942 by an anonymous donor and supports one senior scholarship. In addition to scholarship, the candidate's possibilities for success in professional work are considered in making the award. The department of welding engineering at Ohio State is one of the two degree-granting departments in that field in the world. The other department is at Osaka University in Japan.

Welding course on records

"Eutectic Welding Institute on Records," a two-hour 33-rpm album of the week-long courses held at Eutectic Welding Alloys Corp., Flushing, N. Y., has been made available to business. The material on the records is the same given Eutectic's district engineers during training.

Welding procedures such as torch manipulation, electrode angle and travel, applications heats, the use of fluxes and selection of correct welding material is given. In addition, "low heat input" joining of aluminum, cast iron, copper and copper alloys, steels, stainless steels and other base metals is covered. An extensive introduction to metallurgy is an important feature. The records are free on a loan basis from Eutectic district engineers.

* * *

Carborundum starts new operating unit

The Carborundum Co., Niagara Falls, N. Y., has established a new operating unit, the Electro Minerals Division, to manufacture and sell silicon carbide and fused alumina crudes, abrasive grain and related electric furnace products in the U. S. Joseph S. Imirie, formerly assistant to the president, will be general manager of the new division.

The Bonded Products and Grain Division, Niagara Falls, which for-

(Continued on page 80)

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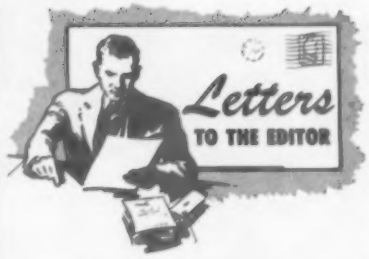

Letters should be addressed to: The Editor, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill. No letter will be published unless signed, but your name will be withheld if you request it.

Most of the congratulatory letters regarding our change of ownership received to date by T. B. Jefferson, editor and now publisher of WELDING ENGINEER, were printed last month. But, as we stated then, we just didn't have room enough for them all. Here are some excerpts from others:

I was very much interested to read Ray Towsend's recent newsletter in which he mentioned that you had now become owner and publisher, as well as editor, of WELDING ENGINEER. Congratulations!

I certainly echo Ray's comments regarding the fine job you have done. Your efforts have been a real constructive force in our welding industry.

John R. Morrill
Gibson Welding Supplies, Inc.

Heartiest congratulations from the Cincinnati section of the American Welding Society on your newly acquired position.

E. A. Harwart
Secretary-Treasurer

Just a short note to wish you all success and happiness in your new venture with WELDING ENGINEER. Speaking for myself, and I'm sure all of the NWSA boys, we sure do wish you a full measure of success, and you can count on us as far as possible.

R. S. McCracken
R. S. McCracken and Sons

Best wishes and heartiest congratulations upon your entry into the publishing field.

We in the welding field know that under your guidance WELDING ENGINEER Publications, Inc., will be a tremendous success. We know that your publications will continue to bring the best authority in welding and welding progress into our homes and places of business.

You may be assured of our continued support.

Paul Broadstone
R. G. LeTourneau, Inc.

Although we will miss seeing you here at McGraw-Hill, I certainly do wish you every success in your new venture. Best wishes.

Robert H. Wood
Aviation Week

My very best wishes on this undertaking. I am certain that in your very capable hands WELDING ENGINEER will continue to play an extremely important role in promoting sound welding engineering. Over the years I have personally benefited considerably by the material published in your journal. Many new developments in equipment, procedures and techniques, initially described in WELDING ENGINEER, are now being utilized in our fabrication. Some have also stimulated extensive development projects of our own and, in turn, have resulted in higher quality fabrication at lower cost.

Helmut Thielsch
Grinnell Company, Inc.

My sincere congratulations! I think that it is wonderful that you are to be "publisher and owner" of WELDING ENGINEER and also that you are going to be able to stay in Chicago.

Rockwell F. Clancy
Rockwell F. Clancy Co.

I am certainly pleased with your purchase of WELDING ENGINEER, and I know that you will do well with it.

John E. Stempel
Indiana University

Welcome back to Chicago—this time as Publisher and Editor of WELDING ENGINEER. You have my congratulations and my best wish for your prospertity and happiness.

H. C. Boardman
Chicago Bridge & Iron Co.

Congratulations! It was with real pleasure that I received the announcement of your new position and the current status of WELDING ENGINEER. It sounds wonderful, and I know, without question, that the success of the book will be assured in your competent hands.

John W. Spoor
Power Products Corp.

Congratulations and good luck on taking over WELDING ENGINEER. I bet you get rich on the deal.

Fred Ellsworth
Kansas University Alumni Office

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Ampco-Trode 160	150-170	190-220
Ampco-Trode 200	180-220	250-280
Ampco-Trode 250	230-270	310-340
Ampco-Trode 300	280-310	350-380

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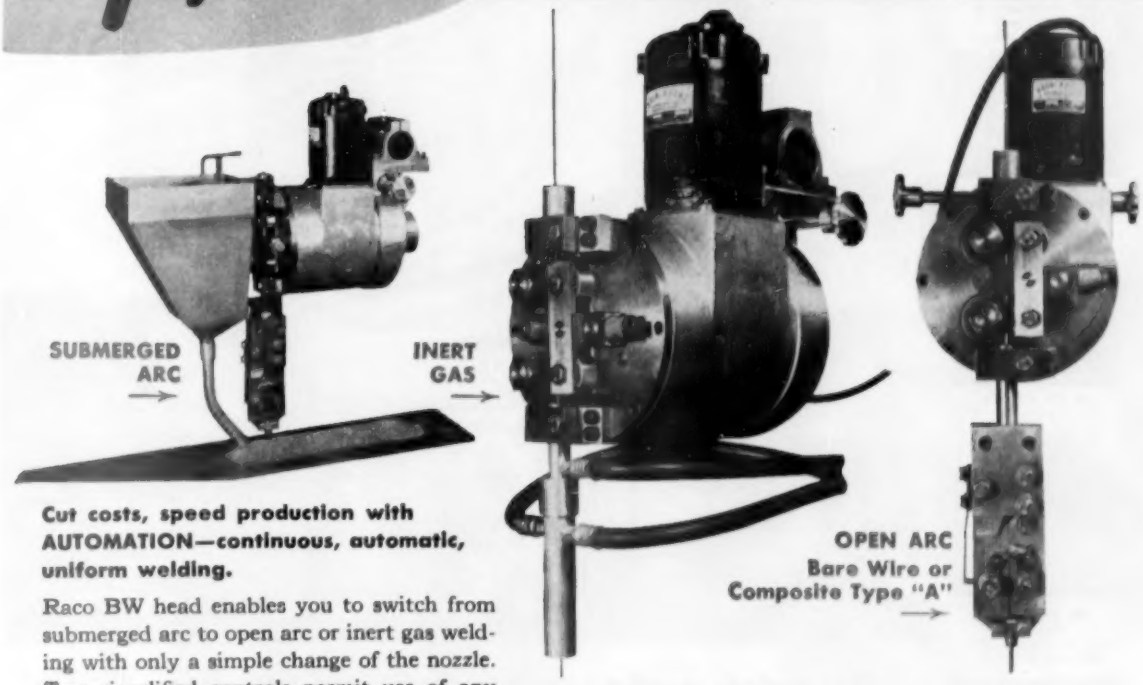

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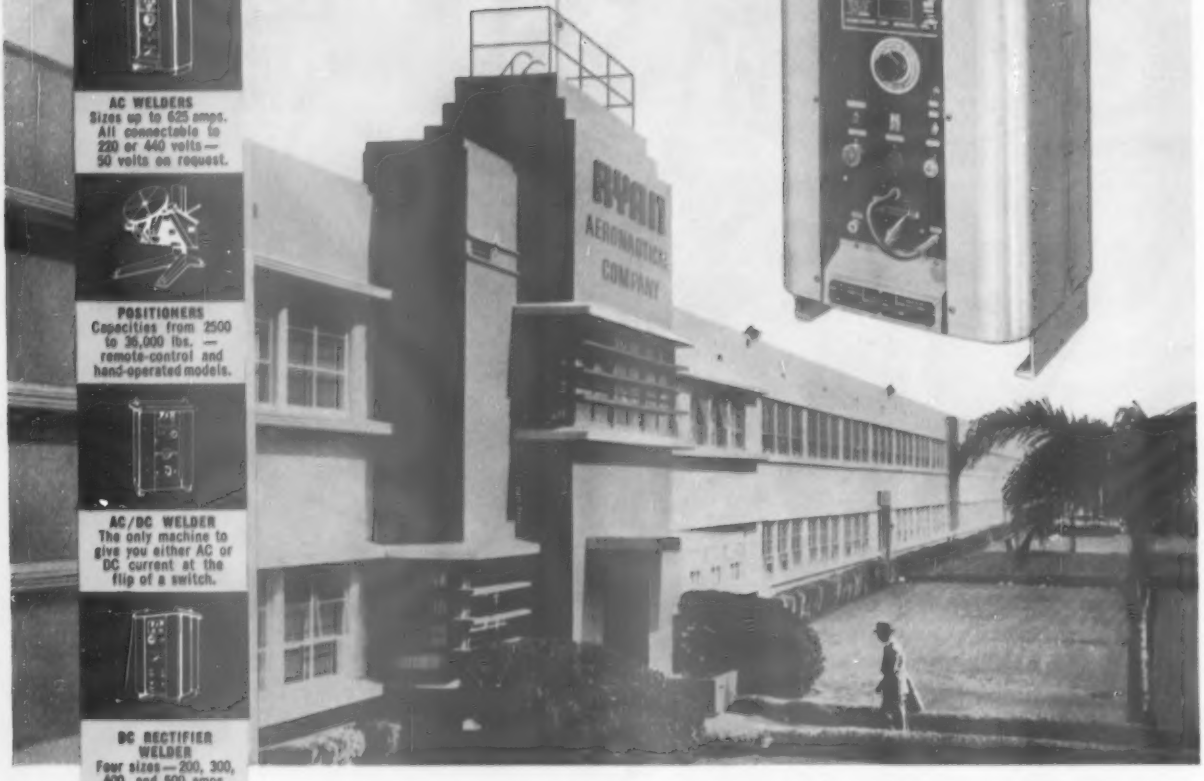

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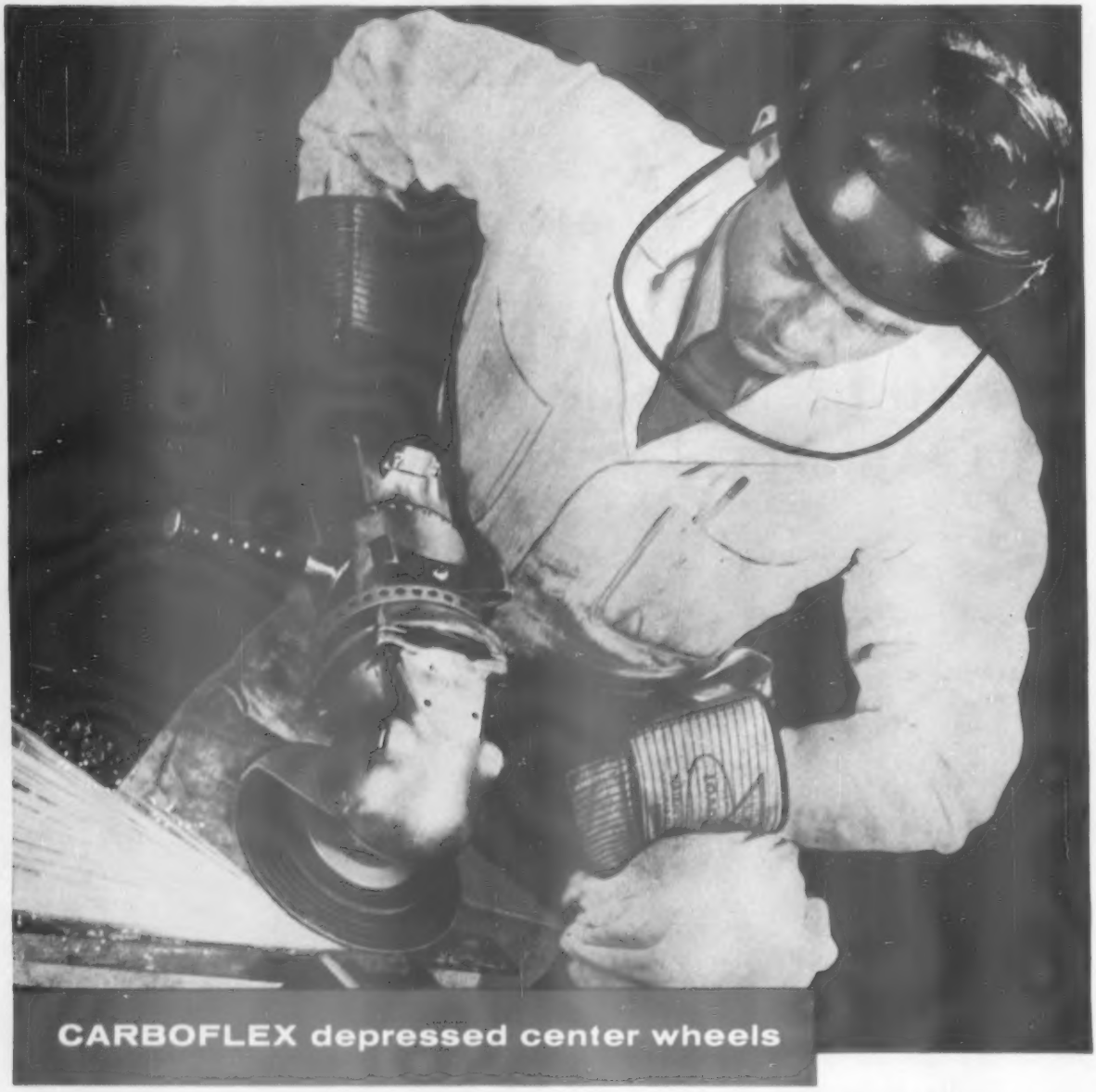

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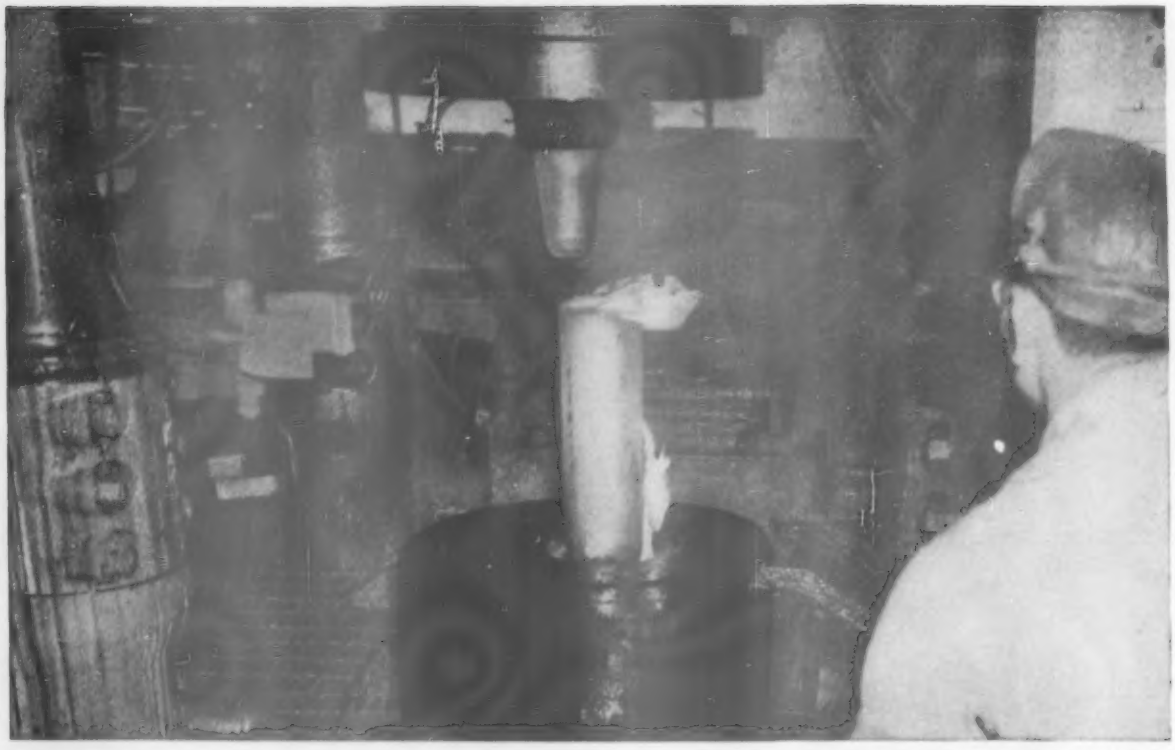

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For information on procedures for applying and for available sizes and prices, write for the booklet "HASTELLOY Alloy C—A Machinable Hard-Facing Alloy."

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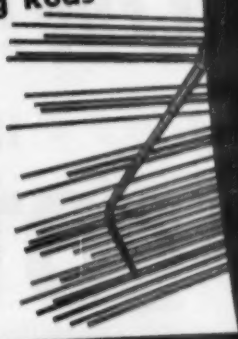

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ESTABLISHED 1916 **Welding Engineer** MARCH, 1955

Welding and wonders of the U. S.

NINETY per cent of the persons who read WELDING ENGINEER live in the United States. We wonder how many of them ever stop to think how great is the country they live in. Only one person out of every 16 in this world is fortunate enough to be a citizen of the United States. While there are more than 160,000,000 of us, not too many of these millions really appreciate the opportunity and good fortune that is theirs.

In recent months we have heard a lot of talk about how bad these times are. Despite this talk, however, the last year was by far the best peacetime year this country has ever known. Never before in a year without a war has there been so much goods produced, so much money earned or so much money spent. Savings were at an all time high, too! Our productive capacity has made the U. S. the best place on earth in which to live.

Sure, there are some living here that will tell you, or try to tell you, that there are better places to live, but they keep right on living here just the same. We can't understand that, for if we thought there was a better country in which to live, we would head for it, instead of just talking about it.

If more Americans were familiar with our production records—records made possible by our ability to join and sever metal—and our ability to produce because we have learned to use machines, a great many of the people of this country would think differently. Last year we turned out nearly 6,000,000 automobiles to bring the total number of cars on the road to about 50,000,000—one automobile for nearly every three Americans. There is even a truck for every 16 of us.

With so much transportation, we must have roads. Though our highway network is inadequate in many areas, it will still take us to every remote spot in this great land. In addition, there are more than 230,000 miles of railroad trackage to carry 40,000 locomotives and 1,800,000 passenger and freight cars, which last year hauled more than 600,000,000,000 (billion) ton-miles of freight.

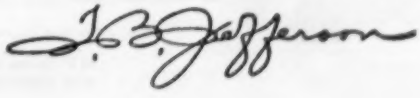
The very fact that we have huge steel-producing facilities and means of joining this steel makes most of these records possible. Our steel mills can produce 1,400 lb of steel a year for every man, woman and child in the country. At the same time, we find we spend nearly $5 for welding equipment, accessories and supplies for every ton of steel produced.

To look at the expenditures for welding equipment in a different light: for each man, woman and child in the country, $4 is spent on welding. It probably is not the right way to look at things, but each of you welding distributors may view your fellow man as $4 worth of welding business.

The cold winter some have experienced makes one think of fuel for warmth. Last year in the United States we dug 1¾ tons of coal for every person in the country. But coal is only one of our fuels. The production in oil is 600 gallons per person. When we think of oil, however, our thoughts generally turn to gasoline, a product familiar to us all—a product made possible because of our ability to join metals so they can withstand high pressures at high temperatures. It is a job that can be done only be welding.

Many of the blessings we enjoy have come about because we are able to join and sever metals readily. If it were not for this fact, it is very unlikely that we would be able to dig the coal or drill the wells for oil that are needed to make these products more abundant here than anywhere else in the world. Surely, the high-octane gas which makes motoring such a pleasure or the production facilities which place even the luxurious automobiles within reach of every worker would not be possible.

The people of America owe a tremendous debt to those who taught us how to fabricate metals and make possible so many labor-saving devices. We of welding have the task of educating our fellow citizens so they will fully appreciate the wonders that have been made possible through the use of such knowledge.



Using a VICTOR No. 310 torch butt with two S2 extensions and No. 8 type 4 tip, Joe Wyman (Shreve Welding Co., Oakland, Calif.) repairs cast iron heating boiler header with VICTOR No. 1 low fuming manganese bronze rod. Inset photo shows 5/64" build-up on undersize castings, done with same No. 310 torch but with No. 5 type 4 nozzle and VICTOR No. 6 square cast iron rod.

VICTOR'S wider work range pays off from the day you select your first VICTOR welding outfit on through a lifetime of reliable service. You buy the torch you need for your present work, add extensions, cutting attachments or special nozzles as they're needed. Result: top-quality equipment that's always perfectly matched to your needs!

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For its 55th annual convention,

IAA heads for Houston

MOREHEAD Medalist: Dr. Augustus B. Kinzel, director of research, Union Carbide and Carbon Corp.

HOUSTON, Texas, and its famed Shamrock Hotel will be hosts this month to members of the International Acetylene Association. The IAA will hold its 55th annual convention March 22 through 24 in the Southwest's largest city.

The program of technical sessions promises a fair share of interesting papers, but, as usual, the highlight of the three-day affair will be the presentation of the Morehead Medal. At 7 p.m. on Wednesday, March 23, the Medal for 1954 will be awarded to Dr. Augustus B. Kinzel, director of research for Union Carbide and Carbon Corp., New York City. Making the award will be W. A. Brown, Jr., IAA director and past president, who is president of The Liquid Carbonic Corp., Chicago.

The James Turner Morehead Medal is presented annually by the Association to the person who, in the judgment of its officers and board of directors, "has done most to advance the acetylene industry or the art of producing or utilizing calcium carbide or its derivatives."

Established in 1922

The award was established in 1922 by John Motley Morehead to honor his father, the late James Turner Morehead, who in 1892 sponsored the experiments which led to the discovery of the electric-furnace method of producing calcium carbide.

Dr. Kinzel will be honored as the 1954 Medalist "for the many sound and important advances he contributed to science and technology, and for the multitude of others that he has inspired and sponsored." He is also being cited for his "forthright courage in presenting new ideas, his facility in explaining them to technical and non-technical people alike," and for his "gracious willingness to share all the fruits of his sound thinking, his fertile imagination and his contagious enthusiasm."

Dr. Kinzel was appointed to his present position of research director last year; he has been actively engaged in research with Union Carbide since 1926. He is a Samuel Wylie Miller Medalist of the American Welding Society and in 1953 was designated for the Metal Progress Hall of Fame. Dr. Kinzel has long been active in IAA, AWS, ASM and several other organizations.

Opening Luncheon

Convention registration (no fee) will begin at 9 a.m. Tuesday, March 22, in the main lobby of the Shamrock. The opening luncheon will be held at noon in the Emerald Room. J. Carl Bode, IAA vice-president and president of National Carbide Co., New York City, will preside. Houston's Mayor Roy F. Hofheinz is scheduled to deliver greetings to the delegates. Following him, President E. A. Daniels, who is vice-president of Victor Equipment Co., San Francisco, will deliver the annual president's message. The guest speaker will be John G. Forrest, business and financial editor of *The New York Times*, whose talk is entitled "America's Business, 1955—Where We Are and Where We're Going."

Two technical sessions will begin at 2:30 p.m. Tuesday—one on piping in the Grecian Room, another on marine applications in the Shamrock Room. The former will include three papers; the latter, two papers and a film. A safety session Wednesday morning will consist of four papers. That afternoon's two technical sessions will be on oil field equipment and on steel production and fabrication. Three papers will be presented at each.

A business meeting on Thursday morning for members only will include the reports of the secretary, consulting engineer, and treasurer. Committee chairmen will also make their reports at this time. Following these, the officers and directors for the coming year will be elected. That morning's agenda also includes the IAA's regular "technical know-how exchange" session.

Malcolm P. Ferguson, president of Bendix Aviation Corp., will be guest speaker at Thursday's joint luncheon with the National Industrial Conference Board. The last item on the program is a demonstration and lecture in the Shamrock Room on "The Magic of Fire."

There it is! The makings of another successful convention of the International Acetylene Association. For convention coverage, watch the pages of WELDING ENGINEER.

1—BOTTOM of low-bed trailer, pictured above, was rubbing the pavement when job of straightening was started. Bow was caused by driving a bulldozer aboard too fast

2—WHY frame of mobile crane bowed is explained to crane operator by John Nacucchio (right in picture at right). Loading the crane in a forward position threw extra stress on the channels when the outriggers were up

Flame-straightening bent

Our last article on stress control and flame-straightening brought so many letters from readers we decided to follow it up with another one. Here it is.

BY HERMAN C. PHELPS

WHEN John Nacucchio, who is now owner of the Pioneer Welding Co., Merchantville, N. J., served with the Seabees during World War II, he had a great many opportunities to try out his theories of flame-straightening. There was a great deal of crash-damaged and battle-damaged equipment to repair. There were also many truck frames that had bent because of overloading. John was continually straightening them as well as cranes, low-bed trailers, structural members, etc. Each of these jobs required individual techniques and methods.

Questions Come First

Today he is still being called upon to straighten similar equipment used in the construction field. Each job is appraised much like an engineer would approach the design of a new type of crane. Before he starts to work, Nacucchio gets the answers to eight questions. Here they are:

(1) What type of steel is it?

(2) Has it been heat treated or not?

(3) Can the bent member be straightened by its own weight or its own weight plus the usual loading?

(4) How much mass is there?

(5) What is the area and the radius of the bend or curve?

(6) How much should the part bend back into place from each heat application?

(7) Should water or air cooling be used?

(8) At what temperature will the steel be required to yield?

As Joseph Holt said in his article "Grass roots of stress control" in the February, 1954, issue of WELDING ENGINEER: "Straightening is simply a matter of proper application of localized heat along an edge that needs to be shortened. The locally applied heat causes expansion, yielding and upsetting, after which the straightening is accomplished by the contraction that occurs during cooling. Judicious hammering sometimes helps the process along."

Here is a example of John's work from the construction field—a low-bed trailer. The 24-ton trailer shown in photo 1 in the straightened condition had a 4-in. bow in it caused by driving a heavy bulldozer too fast. When the dozer was stopped suddenly, it threw so much force on the 14-in. I-beams that they buckled.

John used his oxyacetylene torch to cut away the baffle plate in front and stripped off the fifth wheel framework. He turned the trailer bottom-side up and placed its weight on the ends, blocking them up so the trailer was 2 ft off the floor. After marking off the areas, he and a helper heated the two I-beams simultaneously all across the widths and for a length of approximately 6 ft. starting at one end. They used two big No. 16 preheating torches with 25 psi acetylene (which we certainly do *not* recommend) and 25 psi oxygen. Preheating continued until the temperature of the beams went up to 800 or 900 F. With those big torches and tips, it took about five minutes to bring the

3—WELDED patch shows the area on frame of mobile crane where outer channel was cut away. This was done in order to straighten the inner channel first. It's typical of the successful flame-straightening jobs accomplished by Mr. Naeucchio

beams

first 6-ft section up to that temperature.

Cooled with Wet Rags

The two 6-ft lengths of the heated beams were rubbed with wet (but not dripping) rags. The rags were wrapped around sticks to make balls about 6 in. in diameter. This heating and cooling process caused the bowed beams to drop 2½ in. at the center. The second time the torches were applied, the temperature came up much faster because the steel was still warm. After another cooling with the rag balls, the bent beams came back into perfect alignment.

After straightening, John welded gussets into corners where the I-beams ran over cross bars—something that should have been done originally. Since completion of this job, the trailer has seen many additional miles and is still straight as a die.

Bent Crane

A job that required a lot of ingenuity was the straightening of the double-channel frame of a mobile crane (photo 2). The crane, with its outriggers still up, had been overloaded forward. This threw the weight of the whole load on the center frame just back of the cab. The frame is a double affair, comprising one 10-by-3-in. channel inside a 10½-by-3 in. channel. When the frame collapsed, one side bowed lower than the other, creating an additional problem.

In preparation, the front end was blocked up by the outriggers, high enough so that the front wheels would come to rest about the time the channels were straightened.

Straightening the inside channel was no mean task. John first cut a 6-in. section out of the top and side of the outside channel (photo 3). He directed the cutting torch at a sharp angle so it would not cut through the inside channel. The bottoms of the channels were not cut.

In this case no wet rags were necessary as the channels were made of hardened steel. John marked off with chalk the places he wanted his helper to heat. This marking was important as each side had to be heated simultaneously. The inside channel had the appearance of an old-fashioned washboard, but, by applying heat from the big tips to the ridges, the front end started to drop, helped by the weight of the engine, cab, etc.

Heat was applied to the top flange and side only, not to the bottom. To heat the bottom would have distorted the length. While the heat was being applied, John watched his helper to make certain they kept together.

Two No. 12 preheating tips were used with a pressure of 20 psi for both oxygen and acetylene. John claims you need this much acetylene pressure to keep the torches from popping when working 2 to 3 in. away from steel.

He ran a line through the chassis to check alignment and applied heat 6 in. on each side of the ridges or buckles. The ridges were then heated until they were red (1,200 F). As the ridges became red, the weight of the front end pulled them out flat and smooth. When one side dropped more than the other, he used a "come along" or a chain jack to pull the frame back into shape.

John never forces any metal to straighten a bent member. It is the combination of weight and heat that does the trick. If he doesn't have enough weight, he adds some. Knowing when to add additional load, and how much, comes from experience.

After straightening the inside channel, a new section was welded across the top and side of the outside channel (photo 3). Today the crane, like the trailer mentioned earlier, is still going strong; yet other shops that had been asked to straighten it had turned down the job as "impossible."

When beams have to carry cranes, bulldozers and similar loads, it is little wonder that they bend.

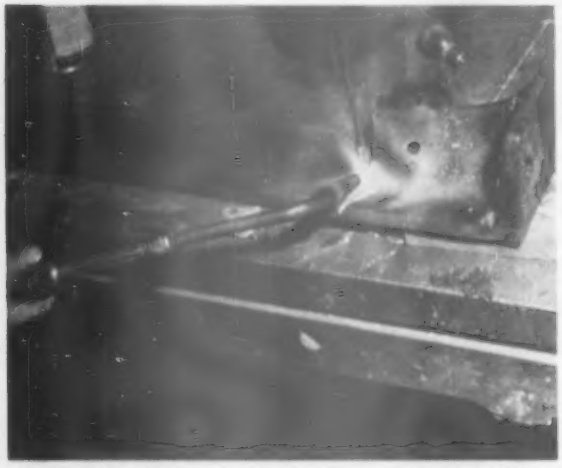
Remember the controversy following publication of "Grass roots of stress control" last year? Well, WELDING ENGINEER will soon publish several more articles by the author of that thought-provoking piece. So watch for Joseph B. Holt's byline in future issues.

EDGES properly veed, the parts are lined up on carbon blocks. Heat is applied on each side of crack

PREHEATING is also done on the back side of the break. Distance heated from the crack is important

How a Yankee braze welds

Ed Roos, plant engineer and master mechanic, believes in braze welding for the repair of heavy machine parts. (What else Ed believes in is told on the page opposite.) The five pictures show steps in the repair of a broken part. Note that the preheating is done with the torch only.



TORCH is now applied to melt the bronze rod. If it doesn't flow easily, parts are not yet hot enough

DOWN to horizontal position as alloy bonds. Alloy may drop out if the puddle receives flame continuously

DONE! The alloy has not fallen down, yet it isn't spread all over either. A job that will last for years

Ed believes

ED BELIEVES: Slow heating by the oxyacetylene torch causes more expansion as compared to arc welding. This allows the pores of the base metal to open up and absorb the metal bronze.

ED BELIEVES: You can get a better finish with the torch because the deposited metal can be dressed out smoother.

ED BELIEVES: The use of ample quantities of good flux will float out grease and foreign matter from the weld area.

ED BELIEVES: The most important single item in securing a good braze weld is *a clean surface.*

ED BELIEVES: When large quantities of bronze are needed, the operator should tack two rods together and melt both at the same time. A better weld will result.

ED BELIEVES: Cast iron and cast steel ¼ in. thick and under should be fusion welded. A fused metal joint is the strongest.

ED BELIEVES: Brazing rods with 10% nickel-silver should be used to build up bearing surfaces. The nickel makes the deposit harder than ordinary bronze. Deposit will show less wear than a steel build-up and is more easily controlled during welding. Furthermore, the bearing is free-turning and machinable through the line of fusion.

AMERICAN Felt Company's plant at Glenville, Conn., owes much to welding. Hardly a day goes by in which the welding department is not called upon to make hasty repairs to such equipment as a felt pounding press, turning roll or flattening hammer.

Much of this older equipment is still powered by long belts that are turned by pulleys on an overhead shaft. Nearly all of it is made of either cast steel or cast iron. All broken parts, whether of cast iron or cast steel, are repaired by braze welding.

Whenever a break occurs, Ed Roos, plant engineer and master mechanic, makes the decision as to how the repair will be made. Ed's ideas on welding ran him into opposition in the beginning. When he first came to work for American Felt, the chief engineer of the company's two plants (one is in New Jersey) was not convinced of the merits of welding. The only torch available was a light aircraft type not suitable for heavy work. Ed asked his boss to okay the purchase of a heavy-duty torch. He must have been a poor salesman, however, because the chief engineer refused to okay the purchase. Nothing daunted, Ed went out and bought his own torch.

Previously, when heavy parts required welding, it was necessary to dismantle the machine and ship the parts 50 miles away to the plant in New Jersey. The welded component was then shipped back to Connecticut to be machined and installed. This meant a two-to-three week delay. The very first weld paid the cost of Ed's new torch and reimbursed him for the purchase price. Incidentally, the first broken crankshaft he repaired is still turning and that was 19 years ago.

Ed has a few hard and fast rules, which we quote above. Quite a few weldors will probably disagree with one or more of them. Remember, however, that Ed has the proofs to back up his theories. He'll take you around and show you mended 4-in. crankshafts that have been pounding felt 24 hours a day for years, and not one has ever broken in the weld or near it. Some shafts under 6 ft long have as many as six welded repairs in them.

HERE'S HOW HE DOES IT

Let's take as an example, a 4-in. crankshaft. Ed's procedure is to grind it down to a neat vee, leaving a space of ⅜ in. to ¼ in. between the ends. Now comes a controversial subject: how much or how little to preheat. Ed's rule is to preheat only 1 in. away from the break for each inch of base metal thickness! Thus the 4-in. crankshaft would be preheated to distance of 4 in. from each side of the weld. This is enough, he says, to keep the parts from cooling off too fast. It avoids the difficulty of having to *force* the cooling bronze to tin out over the break.

Ed does not start welding until the base metal is cherry-red, even when he is welding cast steel. He doesn't believe it necessary to preheat the whole of a flywheel, pulleys or shafts if you heat each side of the break to the distance given by his rule.

Tip size is another thing that Ed feels is very important. He advises the use of a larger size tip than is usually considered necessary in order to bring the temperature of the base metal up quickly.

If you use a tip one size larger than that recommended by the torch manufacturer, a softer flame will result. You can then hold the torch farther away from the weld. This helps maintain a large puddle of weld metal. It tends to stick together and not flow too far ahead. When the bronze flows too far ahead, it is apt to cause flaws in the weld deposit.

Ed will weld the face of a pulley 6 in. wide without any preheat at all. First he cuts the face of the pulley in two to allow for expansion. He then welds the spokes. If the rim of the pulley has a flanged edge, he welds that next and lastly the face.

Whenever possible, he welds only a smooth metal. Occasionally, he will have to weld against a rough fracture, into which the flame comes in direct contact. This is where "heat control" comes in handy. The big tip, held farther away, does not burn the tiny metal or carbon particles of the fracture.

Over the years, Ed has found that braze-welded repairs hold up the best for him. He swears that not one braze weld in a thousand has ever failed him, and he's got the evidence to prove it.

Welded toll gates

ENTRANCE toll gates to Garden State Parkway at Union, N. J.

Chances are the next time you pass through a welded unit of a collection gate on one of the new eastern superhighways it will be through one manufactured by Taller & Cooper.

BY WALTER PALMER
Welding Specialist
The Champion Rivet Co.

COMPLETELY electrified toll gates for turnpikes represent the latest in design and function. An example will be found on the new Garden State Parkway, which, when finished this year, will extend from Paramus, N. J., to Cape May, a distance of about 168 miles. Partially in use now, it will become the longest and most modern of the "barrier-type" toll roads.

The collection booths being installed along this highway are welded steel products and are being built by Taller & Cooper, of Brooklyn, N. Y. The welded construction results in sturdy, permanently tight and weatherproof booths of clean design.

Basic assembly of the booths themselves starts with fabrication of steel in 12-gage to 3/16-in. thickness. Photo 1 shows a weldor putting together the various flats to form the framework of the booth. The booth at this point is lying horizontally and is being tacked every 4 in. prior to final welding. Though welding is done mainly in the flat position, some finishing is accomplished with vertical passes. A special non-spattering type of E-6012 electrode is used, on both a-c or d-c machines, whereby a close arc and flat-bead appearance is obtained.

Photo 2 shows the unit as finished and standing in normal vertical position, where full inspection is made. James Pert, welding foreman, is pointing out some details to the weldor adding the finishing touches. After inspection, this booth is ready for final assembly into one complete toll unit or entrance. The assembly of the several booths into units is shown in photo 3.

The several men shown in photo 3 are adding more final touches and installing the controlling mechanisms, wires and electronic devices used for counting, recording and compiling.

On the stainless interior parts of a booth, tack welding and short runs are used to hold various members in place. When panels are put into place they present a solid surface, both inside and out, without exposed seams.

To protect both the toll taker and passenger of a vehicle, the canopy construction is made both weatherproof and watertight. Bolted construction is employed so that units can be readily taken down or put together in the field, but each section is entirely welded. Photo 4 shows the welded corner construction of a unit and the bolt holes used to join the sections together in the field. Practically no welding is done at the installation.

The canopies are covered with a heavy corrugated steel sheet, protected by metallic coating. These sheets are fabricated in an enlarged area, several sections at a time. After the frame is completed, the corrugated roofing is welded in place with an E-6013 electrode.

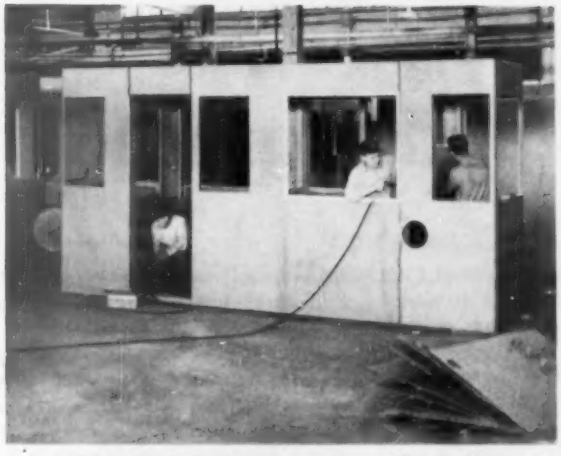
During this welding, care must be taken to preserve the metallic coating on the exposed side. Though complete fusion between roofing and beams is necessary, too much penetration cannot be permitted as excess heat will destroy the metallic coating on the exposed side of the roof. For the same reason, no undercutting is permissible. Welding is done with 3/32 in. and 1/8 in. electrodes and a-c or d-c equipment used at carefully controlled settings.

A part of the toll unit goes underground and is responsible for the recording of each car's passage through the gate. Compression of this part four-contact, tamperproof treadle operates the microswitches that record another vehicle having gone through. The "basket" shown in photo 6 is made of flat bar stock, angles and beams. Every joint is welded, and there are approximately 60 to 80 welds on each unit. The basket is not seen from the roadway as it is covered with a panel over which the vehicle rolls. Some stainless parts are used in its construction. Electrodes of type 310 stainless are used to join stainless-steel to carbon-steel parts.

Taller & Cooper has been recognized as an outstanding manufacturer of this highly specialized product. Its long experience is reflected in the appearance, serviceability and efficiency built into the toll-gate booths pictured above.

1—ASSEMBLY starts with welding flats to framework

2—SECTION of toll booth is nearing completion here



3—SEVERAL of the booths are assembled into a unit

4—CORNER construction is welded. Note bolt holes

5—WHEN car passes through gate it actuates device which . . .

6—RECORDS car's passage through gates

This picture sequence illustrates another application where . . .

1—ARMS for hoods were Mig welded, resulting in a $1,402 saving

Mig and Tig welding

BY GEORGE KOTCHER
Technical Representative
Metro District
Air Reduction Sales Co., Inc.

GUARANTEED Welding Engineering Co., of Clifton, N. J., recently applied both Mig and Tig welding processes to aluminum in fabrication of 24 hoods. The hoods are used in the pickling process for manufacture of galvanized steel sheet. Though one hood measures approximately 6 ft by 3½ ft, it is easily handled on the pickling line by one man because of the lightweight material. All 24 hoods were completed in two weeks to meet an urgent delivery schedule.

Apart from high welding speeds obtained, a major factor contributing to fast production and economy on this job was replacement of the casting method by welded fabrication for producing 48 arms—two for each of the 24 hoods—made of 6061T stock, 1½ by 2½ by 44 in.

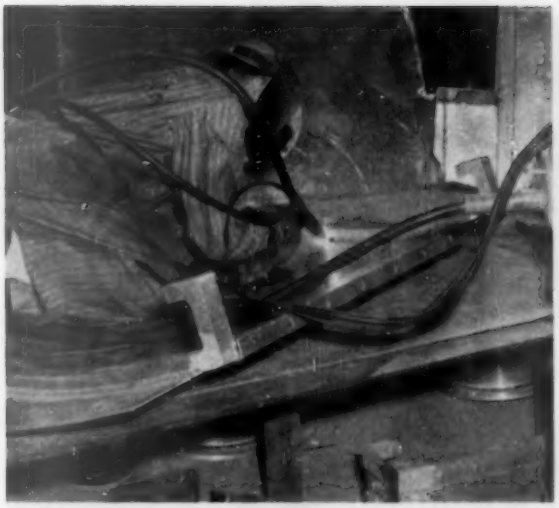
Preliminary investigation of this phase of the operation had revealed that a mold for casting the arms would cost $480 and each arm $40—a total of $2,400 for the 48 units. Moreover, delivery would have taken 18 weeks. The fabrication of the arms by welding cost $278 for material and $720 for labor—a total of $998 and a saving of $1,402. A 16-weeks' saving in delivery time was also effected.

Fabrication of the arms was accomplished by two Mig (metal inert-gas) welds on prepared beveled joints. This operation created a hook at the end of each arm (photo 1). A penetration of 100% was achieved for completely sealed and solid joints.

Another phase of the job worth noting was the big time-saving realized with the tacking of these arms to the ⅛-in. shell of aluminum. This was also done by Mig welding. High current densities obtainable with the process permitted instantaneous tacking (photo 2).

The outside edge seams of the

4—MIG process was used on the nozzle's circumferential welds



2–TACKING of arms was instantaneous because of high-current densities realized with Mig process

3–OUTSIDE edge seams of hood were then Tig welded, using a filler rod and 16 cfh argon

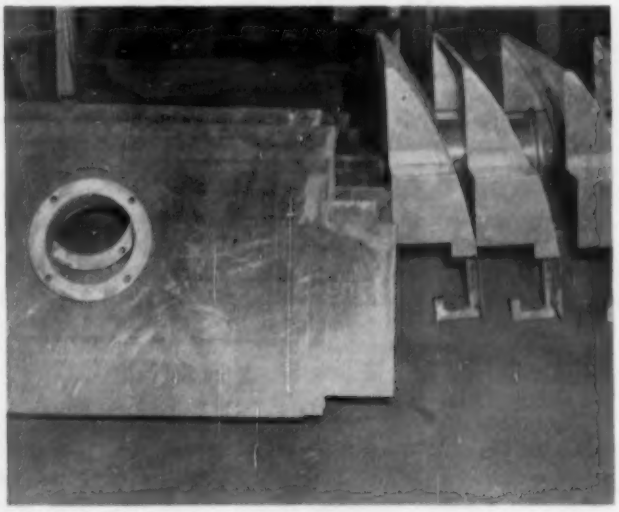
have teamed up

hood were Tig (tungsten inert-gas) welded. The operator used a filler rod and 16 cfh argon at 120 amp, high frequency, (photo 3). These welded seams served as added reinforcement or as a kind of back-up for the inside Mig welds, which were then made. For these, 1/16-in. aluminum wire was fed at a speed of 230 ipm. Average welding speed was 22 ipm, using 30 cfh of argon, 28 volts and 210 amp.

An additional component — the nozzle of the hood—also called for both Tig and Mig processes. This unit is made of ⅛-in. rolled aluminum and a ½-in. flange, 10½ inches in diameter. The circumferential flange welds were made by Mig welding (photo 4). The entire unit was then Tig welded to the hood (photo 5). Completed hoods are shown in photo 6.

An abrasive wheel was used to finish the surfaces of these hoods, which were later covered and lined with rubber. Quality welds—clean, dense deposits—were essential to insure efficient service of the end product.

5—ENTIRE nozzle unit was Tig welded to hood



6—COMPLETED hoods. Surfaces were finished with abrasives

430

RIM and bottom of basket for a pit-type air-tempering furnace are of cast type 430 stainless. Shell is rolled from type 430 sheets. A ⅛-in. type 430 lime-coated electrode was used for all welded joints

Courtesy Westinghouse Electric Corp.

How to arc weld the different types of stainless steels—II

Last month Mr. Spencer covered the austenitic or 300 series; this month the ferritic and martensitic steels.

BY LESTER F. SPENCER

THE martensitic straight-chromium steels, identified as the Group B alloys, are hardenable by the standard heat and quench procedure. When advantage of the hardenability is employed, a corrosion-resistant material is also obtained. Due to the air-hardening characteristics of these steels, extreme care must be taken during welding; care becomes increasingly important as the base carbon within the analysis increases. Established practice has indicated the use of both a preheat and a post-heat as necessary steps in the welding of the martensitic group. Of these steels, only 414 and 431 contain nickel, and the nickel content of the two nickel-bearing steels is only 1.25-2.50%.

Within Group B classification, a subdivision is frequently made into steels that contain less than 14% chromium and those that contain more than 14% chromium. The steels that contain less than 14% chromium are known to be intensely air-hardening, which makes welding more difficult but offers other advantages. Any decrease of ductility, impact strength or toughness can be remedied by suitable heat treatment. Typical types within this group are 410, 414, 416, 420, etc.

The martensitic steels with chromium content between 15 and 18% are partially hardenable and are considered more easily welded than steels of the lower chromium types. However, care must be taken during welding since these alloys are also air-hardening.

Ferritic Alloys

Most alloys within the Group C classification have over 18% chromium, and none of them contain nickel. These compositions are known as the ferritic alloys. They are non-hardening, non-responsive to heat treatment and may be subject to increased grain growth during welding. This latter characteristic is particularly unfavorable to the ferritic compositions since it is accompanied by a loss of ductility and impact strength. Furthermore no corrective treatment other than cold working (exemplified by cold peening) is available to reduce the objectionable large-grain size.

In general, those stainless compositions that have chromium as the essential alloying element are more difficult to weld than the chromium-nickel alloys discussed in Part I. In regard to the characteristics of these materials, the production weldor should know the following facts:

(a) Unlike the chromium-nickel stainless steels, the straight-chromium analyses are not subject to intergranular carbides. The welding heat does not decrease the ability of these analyses to resist corrosion.

(b) Like the chromium-nickel

Effects of Heat on the Straight-Chromium Stainless Steels [4]

<table>
<tr><th></th><th>Corrosion Resistance</th><th>Hardening Characteristics</th><th>Ductility of Metal</th><th>Response to Heat Treatment</th><th>Grain of Metal</th><th>Coefficient of Expansion</th><th>Heat Conductivity</th><th>Electrical Resistance</th><th>Melting Point</th></tr>
<tr><td>4% to 14% Chromium</td><td rowspan="3">Not susceptible to loss of resistance through intergranular carbide precipitation

For best properties should not be heated over 1600 degrees Fahr.</td><td>Harden when cooled in air from high temperatures</td><td>Decreased by welding

Improved by heat treatment</td><td>Wide range of mechanical properties obtainable under heat treatment</td><td rowspan="3">Weld deposit laid down above melting temperature tends to grow large grains upon cooling.

Also grain size in adjacent metal will increase with application of heat</td><td rowspan="3">Same or slightly less than that of plain-carbon steel</td><td rowspan="3">Varies from 70% to 40% of mild steel, depending on the chromium content</td><td rowspan="3">Varies from three to six times that of plain-carbon steel, depending upon the chromium content</td><td rowspan="3">Slightly less than mild steel</td></tr>
<tr><td>14% to 18% Chromium</td><td colspan="3">Intermediate to low and high chromium alloys. Behavior depends upon exact relation between carbon and chromium contents.</td></tr>
<tr><td>18% to 30% Chromium</td><td>Do not harden even when cooled rapidly</td><td>Reduced by welding. Improved by annealing, depending on chromium content</td><td>No range of properties obtainable by heat treatment</td></tr>
</table>

stainless, both the heat conductivity and electrical resistance of the straight-chromium stainless will necessitate a lower current input than that used for mild-steel welding. The heat conductivity will vary from one-half to two-thirds that of mild steel; the electrical resistance will be from three to six times that of mild steel.

(c) Unlike the chromium-nickel stainless, the coefficient of expansion is about the same or slightly less than that of mild steel. Expansion under the influence of a welding heat will thus be similar to that of mild steel.

(d) The grain size of the straight-chromium steels will increase by the application of a welding heat; this increase is dependent upon the analysis, the temperature and the time-at-temperature. In the martensitic alloys (Group B), a remedial heat treatment will counteract the effect of increased grain size. The ferritic alloy types (Group C) do not respond to a heat treatment.

The effects of a welding heat on the straight-chromium stainless alloys are illustrated in the table. The martensitic alloys (Group B) are air-hardening and, depending upon the analysis, have varying degrees of weld brittleness, which can be remedied through the use of a heat treatment. Those alloys containing up to 14% chromium have intensely air-hardening characteristics, while the alloys that have a chromium content between 15-18% have lesser air-hardening tendencies.

Many of the procedures mentioned in Part II for the austenitic alloys hold equally as well in the welding of the straight-chromium compositions regardless of whether they are within Group B or Group C classification. These include such factors as joint design, joint preparation, the use of jigs and fixtures, reduced current requirements, permissible maximum electrode size, etc.

Welding Martensitic Alloys

In the welding of the martensitic alloys, it is usually essential to have a preheat of about 400 F to minimize bead cracking. After welding has been completed, a postheat, either in the form of a full anneal of the entire structure or a stress-relief anneal of the weld joint, is necessary. In many instances, a postheat between 1,300-1,450 F is satisfactory; this should be followed by furnace cooling at a rate of 50 to 100 degrees

per hour to about 1,500 F, after which air cooling is permitted.

Due to the air-hardening tendencies of the martensitic alloys, bead cracking is a major problem. On a vee-joint design, a single pass should be used only when absolutely necessary and then with back-up strips. Where bead cracking on the initial pass is obtained[6], this can often be attributed to poor fit-up of backing strip or too wide a gap space. In addition, wide variations of current and arc length should be avoided, and the beads deposited should be small. Where care is taken, d-c electrodes designed to deposit a weld bead of similar analysis to the base plate can be used. In the event that maximum ductility of weld is required, an austenitic electrode, such as E310-15, can be used. However, the weld zone, through the process of dilution with the base plate, may be fairly hard; this is especially true when the base carbon is rather high. Thus, both preheat and postheat are usually required, the latter operation being essential in relieving hardness and possible stress concentrations. In a stress-relieving treatment, the work should be magnetic prior to entry into the furnace; otherwise the stress relieving will be useless.

Suggested procedures for welding of some specific analyses are:

Both types 403 and 410 have marked air-hardening properties and require both a preheat of about 300 F and a postheat of 1,300 to 1,450 F. A d-c electrode of E410 analysis can be employed; however, the E310-15 is used where maximum ductility of weld is required.

Type 414 stainless has characteristics similar to type 410 and, in general, the same welding procedure would apply.

Type 416 is the free-machining analysis within this group. As stated for type 303 stainless, both porosity and "hot shortness" may result. Where it is necessary to weld this analysis, it is advisable[3] to hold the base carbon to an absolute minimum so that preheating may be avoided. It is wise, however, to consider the use of another analysis rather than weld 416.

Due to the variation of carbon content within type 420 stainless, the weldability of this analysis may vary. In the low-carbon analyses, below 0.15%, a preheat of 350 F is suggested along with slow cooling without postheating. The higher carbon content compositions require both preheating and postheating with necessary precautions taken to reduce bead cracking. The E420 d-c electrodes may be used where full mechanical properties are required; however, the type E310-15 electrode can be used to obtain maximum ductility of weld joint.

The 440 compositions are extremely air-hardening due to their high carbon content; this fact also increases the tendency toward weld cracking. These steels are not usually recommended for welding, especially where impact or shock loading is anticipated[3]. Where welding is required, the E310-15 electrode is employed; however, weld hardness may result. This means that both preheating and postheating be included in the procedure so as to obtain the most favorable physicals of weld joint. To reduce grain growth within the weld deposit, especially where toughness of weld zone is of importance, the chromium in the weld may be held to the minimum that will meet specifications[5]. In addition, the use of a heat treatment will also improve this condition.

The 420F and 440F are free-machining analyses and are not recommended for welding.

Types 501 and 502 have low chromium content (4-6%) but due to their corrosion-resisting properties are classified within the stainless group. When the E502-15 electrode is employed, a preheat of from 300 to 500 F is used. The postheat will be at 1,550 F, cooled at 50 degrees per hour to a temperature of 1,250 F. Where neither a preheat nor postheat is feasible, the austenitic electrode E310-15 can be employed; the joint will be able to withstand some impact and bending stresses.

Welding Ferritic Alloys

In the welding of the Class C or ferritic alloys, the major difficulty is that of grain growth in the weld area, resulting in a loss of both impact and ductility properties. Since this group of alloys is non-hardenable, there is no remedial heat treatment. However, a preheat of 350 F and a postheat of 1,200 F are often recommended. The 350 F preheat is maintained throughout during welding. The postheat is followed by rather rapid cooling to below 800 F.

To minimize grain growth, it is often suggested that small-diameter electrodes, low current and stringer beads be employed. Peening of the weld deposit may also aid in increasing impact strength of the weld metal; however, this must be done with care.

Here are some comments on the welding of specific analyses:

Type 405: The E310-15 electrode is usually selected where maximum weld toughness is required. Special electrodes that will deposit a weld of similar composition to the base plate are also available. Both preheat and postheat are recommended.

Type 430 will exhibit a brittleness of weld zone due to grain growth. Normally, this material is not recommended for welding where impact, shock or vibrational stresses are anticipated. If it must be welded, a preheat of 300 F should be maintained during welding to reduce the chances of brittle failure. Usually an E310-15 electrode is used to obtain some ductility of weld; in many instances, however, an E430 electrode is employed.

Type 430F, the free-machining analysis, is not usually recommended for welding.

Neither type 442 nor 446 is recommended for welding since the weld zone will be brittle because of grain growth. Using an E310-15 electrode, the weld deposit will have some ductility, though the heat-affected zone will exhibit brittleness. A preheat of 300 F should be maintained during welding. A postheat of 1,500-1,600 F, followed by a rapid air or water quench, will result in maximum toughness.

References

1"ASTM Specification A298-48T," ASTM Standards, 1952, Pt. 1, pp 1134-1147, American Society for Testing Materials, Philadelphia.

2"Westinghouse Arc Welding Equipment and Electrodes," Cat. 26-020, Westinghouse Electric Corp., Pittsburgh.

3"Procedure Handbook of Arc Welding Design and Practice," ninth edition, 1950, The Lincoln Electric Co., Cleveland.

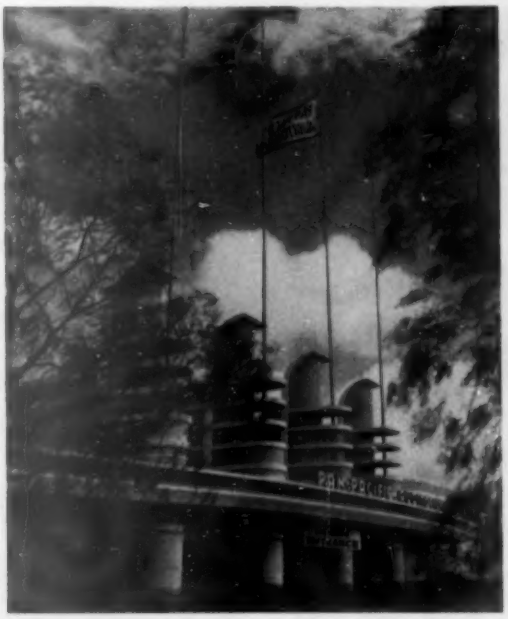
4"Welding Stainless Steel," 1943 edition, Allegheny-Ludlum Steel Corp., Brackenridge, Pa.

5"Welding Stainless Steels," L. F. Spencer, *Iron Age*, Oct. 20, 1949.

6"Stainless Welding Electrodes," Page Steel & Wire Div., American Chain & Cable Co., Inc., Monessen, Pa.

7"Welding Handbook," third edition, 1950, American Welding Society, New York City.

8"Welding & Metallurgical Aspects of Stainless Steel," W. G. Blackwell, General Electric Co., Schenectady.



ABOVE—Discussing plans for Western Metal Congress are four chairmen of AWS sessions. From left, they are Leo West, Douglas Aircraft Co.; Francis Stevenson, Aerojet-General Corp.; Robert Hay, Linde Air Products Co.; and Arthur Wynn, Harnischfeger Corp.

LEFT—Pan-Pacific Auditorium will be site of Western Metal Show. It's said to be largest exposition building west of Chicago

Western Metal Congress in LA

A COMPARATIVELY new topic will be on the agenda this month when the American Welding Society participates in the Ninth Western Metal Congress at the Ambassador Hotel in Los Angeles. The welding of rockets and other guided missiles will receive attention in a number of papers to be presented by authorities in that field.

The Congress will run from March 28 to April 1, as will the Ninth Western Metal Exposition, which will be held in Pan-Pacific Auditorium. In addition to AWS and the American Society for Metals, there are about 23 other technical societies sponsoring both events.

The Congress will feature nine sessions on new developments in welding, with equal emphasis on heavy welding and aircraft-rocketry welding. Hugo W. Hiemke, president of California Alloy Products Co., Los Angeles, and AWS program chairman, announced the sessions will be:

Morning of March 28, welding research; that afternoon, welding of hardenable steels; March 29, all day, aircraft and rocketry; morning of March 30, welding of pressure vessels and piping; that afternoon, heavy-plate welding; March 31, all day, inert-gas welding; morning session only on April 1, brazing and hardfacing.

At this writing, the following papers were scheduled to be delivered at the aircraft and rocketry panel:

"Fusion Weldability of 24ST Aluminum Alloy," by John B. Arthur, research welding engineer, North American Aviation, Inc., Downey, Calif.

"Silver Alloy Brazing of Electrical Connections," Cleon L. Chapen, brazing engineer, Gilfillan Radio Co., Los Angeles.

"Resistance Welding of Airframe Structures," Dennis Samuelson, welding engineer, and F. G. Harkins, chief welding engineer, Solar Aircraft Co., San Diego.

"Titanium Alloy Fusion Weldability and Correlated Weld Metallurgy," Charles W. Handova, metallurgist, and Harlan L. Meredith, welding research engineer, North American Aviation, Inc.

"New Full Automatic Weld Tooling for Aircraft and Missile Joinery," Byron Russell, Airline Welding Co., Hawthorne, Calif.

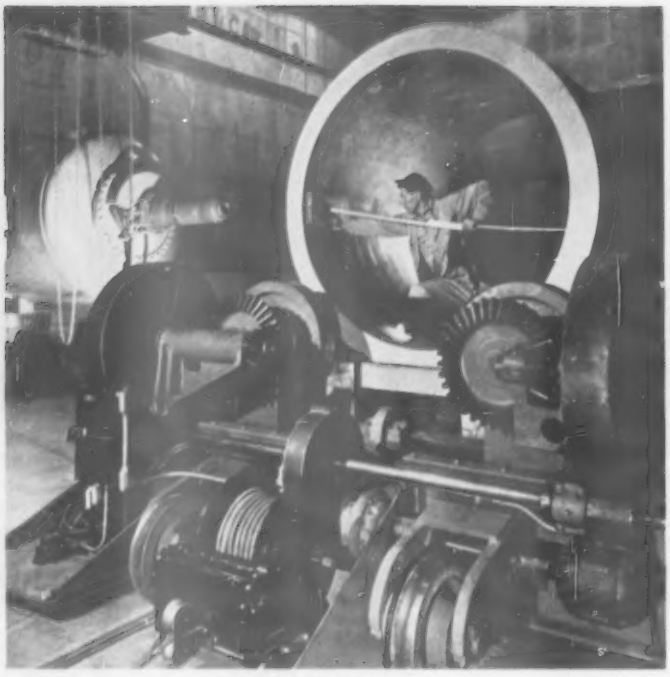
"Metallurgical Aspects of Silver Brazing Titanium to Titanium," N. A. Tiner, metallurgist, North American Aviation, Inc.

Speakers for other sessions include W. A. Saylor and R. Roberts, Consolidated Western Steel Div., U. S. Steel Corp., Los Angeles; D. C. Smith, Harnischfeger Corp., Milwaukee; C. W. Funk and M. J. Granger, Aerojet-General Corp., Azusa, Calif.; Harry J. Bichsel, Westinghouse Electric Corp., Buffalo; Frank J. Pilia, Linde Air Products Co., Newark, N. J.; Frank Drahos, Byron-Jackson Co., Los Angeles; John H. Berryman, Air Reduction Sales Co., New York City; Alan V. Levy, and Robert W. Wickham, Marquardt Aircraft Co., Van Nuys, Calif.; R. W. Tuthill, General Electric Co., York, Pa.; C. H. Chatfield, Handy & Harman, Bridgeport, Conn.; George C. Driscoll, Western Alloy Engineering Co., Montebello, Calif.; Otis Cullum, Bakersfield, Calif.

Some of the subjects they will discuss are low-hydrogen electrodes, submerged-arc welding and inert-gas applications (including the new inert-arc processes for welding mild steel).

New welding developments and many production features evolved in the past year by the aircraft industry will be among the things to see at the Exposition. The show will cover 150,000 sq ft of space, all on one floor level. It will be open evenings during the course of the Congress. Admission will be by registration.

The Babcock & Wilcox Co. is an extensive user of nondestructive testing equipment and inspection apparatus. It was a pioneer in the radiography of welded pressure vessels. Read this resume of some of its applications, and you'll see why X-ray is . . .



LARGE pressure vessel and 2,000,000-volt X-ray unit are positioned for radiography of weld

One key to B&W's success

BY DAVID GOODMAN
X-Ray Dept.
General Electric Co.
Milwaukee

"THE X-ray film is one cornerstone on which rests the foundation of today's industrial and utility boilers employing temperatures and pressures undreamed of 30 years ago." So state testing specialists at The Babcock & Wilcox Co.'s Boiler Division works in Barberton, O. B&W celebrates its 25th anniversary in the use of X-ray this year.

Long a Pioneer

When Dr. H. H. Lester at Watertown Arsenal showed in the '20s the general industrial advantages of radiography, B&W's personnel sent test plates to Watertown for examination. These proved conclusively the value of X-ray in the welding field. Soon thereafter (in 1929) B&W bought its first X-ray unit, a 200-kv redesigned medical machine; in 1932, it bought the first 400-kv unit ever built.

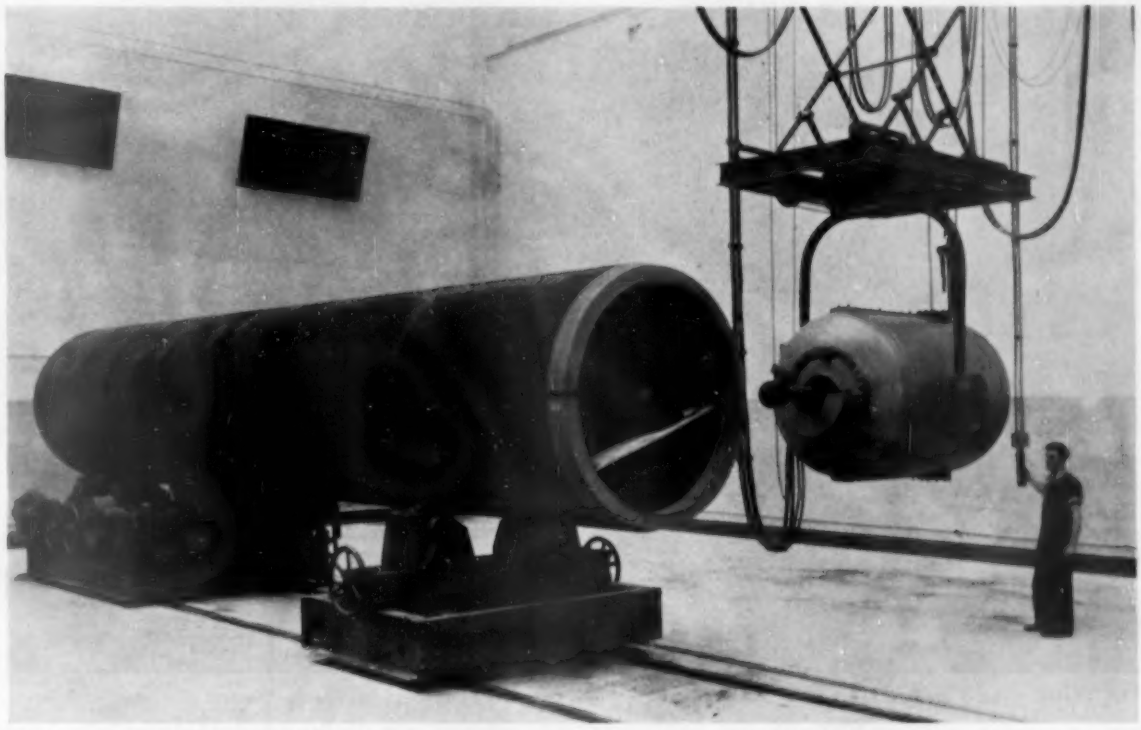
From 1932 to 1934, B&W carried out what is believed to be the most extensive weld-radiographic projects in the world—X-raying every inch of weld metal in the penstocks of Boulder Dam, using the first oil-immersed 300-kv unit. The amount of film used in this one job was greater than all the rest of the X-ray film that had been used throughout the world up to that time.

In 1937, B&W was the first to acquire the new industrial 1-mev machine. It was in order to take full advantage of the latitude and sensitivity possible with this high-voltage unit that fine-grain film was developed.

The company in 1947 became the first fabricator of welded pressure vessels to acquire the 2-mev unit, which is needed to handle vessels up to 7 in. in wall thickness in an economical time. On large 180-ton drums, the time for radiography, even with the 2-mev unit, is beginning to approach the time used in welding.

Insured of sound welds through X-ray techniques, the welded pressure vessel has gone to higher and higher pressures in relatively smaller sizes and has been able to utilize thicker plates to withstand higher pressures and temperatures.

Another prime event in the pressure-vessel world is the recent delivery to the Detroit Edison Electric Co. of the largest boiler ever built (see page 6, Welding Engineer, December, 1954). It will furnish steam sufficient to produce 250,000 kw of electricity. The boiler will be built around a pressure vessel weighing 205 tons capable of withstanding 2,150 psi pressure. It is fabricated of



ANOTHER 2,000,000-volt machine. This is a Babcock & Wilcox, Ltd., installation at Renfrew, Scotland. It is used on huge pressure vessels which dwarf even the large X-ray unit itself.

steel of 70,000 psi tensile strength, 5 13/16 in. thick, and 72 in. internal diameter. This is expected to represent the ultimate to date not only in generating capacity but also in the low ratio of power produced per unit of fuel consumed.

Coming: 5,000 psi

Today, B&W looks to a new future in the field of vessels using the heretofore unattainable principle of electrical power generation — the "Universal Pressure" boiler, so called because it will operate either above or below the critical pressure barrier. This unit will be the first of its kind ever built. It will permit the industry to start with vessels operating at 5,000 psi! The large welded drum will not be necessary since the superheated steam is forced through long tubes at such a high pressure that its density equals that of water. However, the super-pressure principle will not obsolete present designs, as not all installations will require such capacities.

For these and the more conventional types of pressure vessels, B&W finds that adequate radiographic inspection is a necessity. The company has in its plants nine X-ray units, ranging from 2,000,000-volt machines down to 220-kv machines. Other inspection equipment includes radioactive sources consisting of radium, cobalt, cesium and iridium; magnetic-particle and fluorescent-penetrant equipment; the mass spectrometer leak detector; dye-penetrant equipment and four ultrasonic inspection instruments.

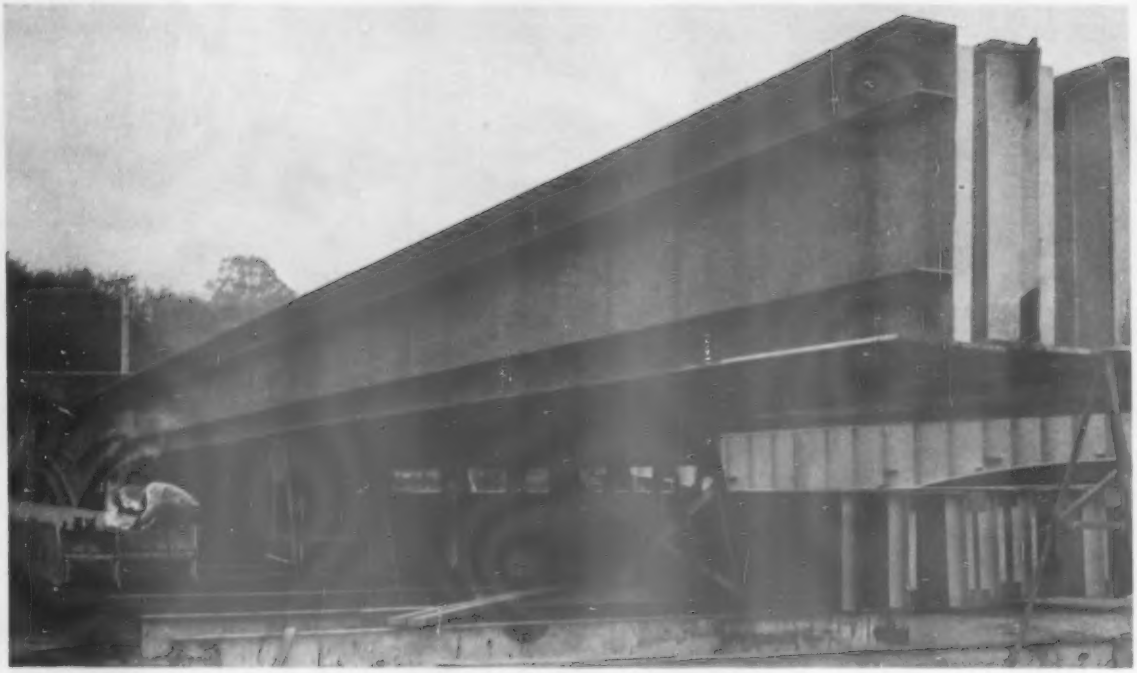
Soon to be acquired will be a 1,000-curie source of cobalt-60, equal in exposure speed to a 1.5 mev X-ray unit. Its role in the B&W inspection picture remains to be determined. As a pioneer in the field of inspection, the firm hopes to find the answers through actual experience.

2,000,000 volt X-ray

The current pride of the inspection department is the 2-mev unit, with which the radiographer has achieved a sensitivity of 1.5% on rolled steel sections as thick as 7 in. B&W employs fine-grain film techniques to secure maximum definition and detail. Whereas the use of this film with lower-voltage apparatus would mean a considerable sacrifice in speed of exposure, a relatively faster exposure time can be maintained with the higher-voltage apparatus. At the same time, the higher-voltage machine, with its very high "r" output per minute, makes it possible to use longer focal-film distances, thus reducing geometric unsharpness and distortion. Consequent improvement in detail and sensitivity is secured. Back-scatter—the bane of many an industrial X-ray operation—is minimized by the use of lead filters.

Another unusual application was to maintain the proper relationship between two tubes — one within the other—throughout their lengths and around bends. X-ray was vital in guiding the bending of these concentric tubes. Tolerance on this particular job was virtually zero.

B&W has checked tank-tread pins and component parts radiographically for the armed forces, has guided the development of new welding procedures and alloys and has solved special problems of its own with the aid of X-ray. According to B&W officials, it is a mistake to regard nondestructive testing, particularly X-ray, merely as a means of finding flaws. It is also a most valuable means of *preventing* flaws.



OUTSIDE welded girders for a New York Thruway bridge have longitudinal stiffeners. Notice the true contours

World's largest girders for new cantilever bridge

BY HERMAN C. PHELPS

BECAUSE the New York Thruway has to cross over a wide expanse of Erie Railroad tracks at Suffern, N.Y., engineers had to design a bridge 900 ft. long. A total of 84 steel girders are required to make the crossing, and 28 of these are the largest in the world, according to E. W. Wendel, deputy chief engineer of the New York Department of Public works. Wendel conceived, designed and planned the bridge as well as supervised and directed its construction.

Each of these big girders weighs 52 tons and has an overall length of 175 ft. Every bit of fabrication was done by manual arc welding.

The welding contractor, J. & K Welding Co., of Yonkers, N.Y., followed AWS welding specifications for bridge and highway construction. More than 100 weldors were kept busy during the peak of construction.

Due to the cantilever design of the girders, field welding will not be required. When installed, each girder will rest on its own bearing surface.

Cambered Girders

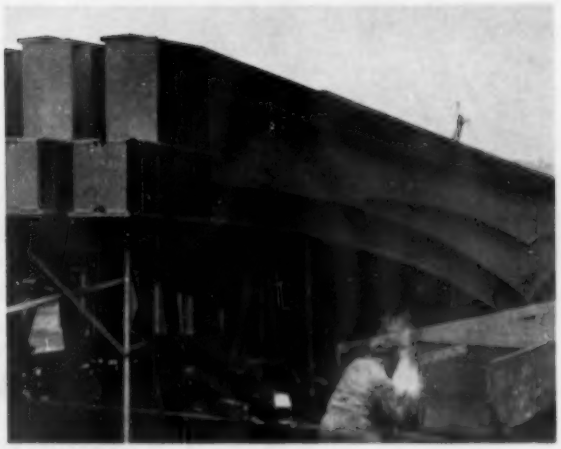
One of the hardest jobs of the welding operations was to maintain the required camber for the complete length of each girder. This necessitated constant vigilance, according to J. A. Klevens, vice-president and production manager of J & K Welding. Never once was track of the camber lost. Jigs, jacking rigs and weights were all used to determine, to arrest, and to control distortion. Said Klevens: "We wanted a straight girder when we finished, not a corkscrew."

First, the web plates had to be laid out for shape and cut to size. Some of the web structural steel was received from the mill in 74-ft. lengths, the longest J & K could get. Most web plating is 13/16 in. thick. The deepest part of the girder is 11 ft, and it tapers off to 4 ft. 8 in. at the ends.

All welding was done with 1/8-in. and 3/16-in. low-hydrogen electrodes, using reverse polarity and amperage as recommended by the manufacturer. All butt joints were double veed. Fillets vary according to thickness of the steel, average throat thickness running from 5/16 in. to 5/8 in. All fillet welds are continuous. The longest welds, 175 ft., were made to attach the flanges to the web plates. Such long welds were made possible by coping the corners of the vertical stiffeners so the welds could run through them.

Most welding was done in a flat position on level bays. Filler blocks of

WELDORS working on bays are truing up, jigging and tacking longitudinal stiffeners on the smaller girders



COMPLETING the fabrication on end of a small girder. All are too long to stand on end for downhand welding

different sizes were used to control camber and distortion. All those girder stiffeners that are hidden from view were welded on vertically. Stiffeners on the outside were attached longitudinally for beauty and symmetry of design. Your reporter would like to add that the exterior trim is beautiful, and that only welding could make such beauty possible. The contours are absolutely perfect, even though every contact area is welded on both sides.

After the stiffeners were attached, the previously assembled, prepared and welded flange plates were positioned for flat welding. Many of the flange plates came from the mill in 84-ft. lengths (again the longest J & K could get). Thickness varies according to location in the girder. At the center, these plates are 3¼ in. thick and 2 ft. wide!

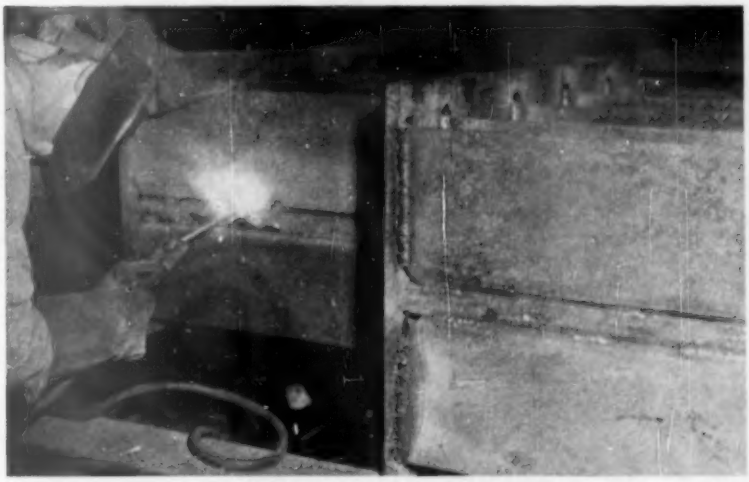
After the flange plates were welded, connection pads, bearing ends and brackets for the connecting frames were installed.

Four Flatcars per Girder

As the girders were needed, they were floated across the Hudson River on barges, then moved on railroad flatcars to Suffern. Because of the great length of the girders, four flatcars were required to haul them, and a special permit from the railroad was needed. The first and fourth cars took all the weight. The two center cars merely acted as buffers.

There are 507 bridges dotting the complete length of the Thruway between New York City and Buffalo. Only one is not under direct supervision of Deputy Chief Engineer E. W. Wendel—the Tappan Zee Bridge across the Hudson River at Tarrytown, N.Y. But the conception, design, plans, specifications and estimates of specifications for all 507 bridges were prepared in Wendel's office, whether a consulting engineering firm was involved or not. Even the ultimate direction during construction is a function of the deputy chief engineer in charge of bridges.

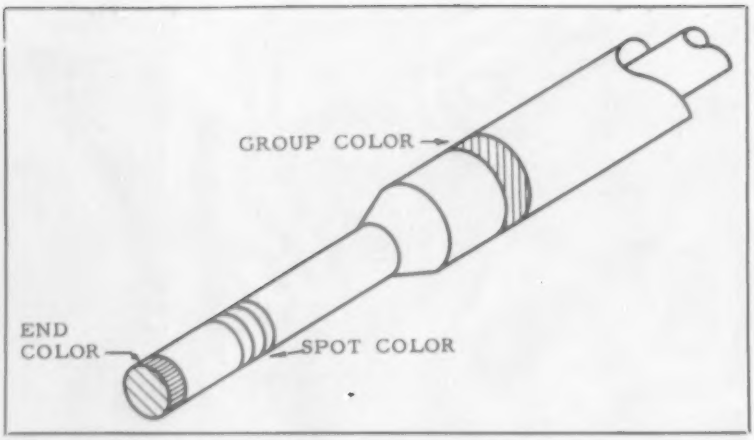
Mr. Wendel's department is to be commended. Not only are all the bridges beautiful, but they have been designed for the functional use of welding.



CLOSE-up gives some idea of amount of welding required for the bearing surface

THIS part of the web is 11 ft deep

The editors present here the introduction of what is expected to be a series of comprehensive articles on . . .



1—LOCATION of color markings for end-grip electrodes

Filler metals for joining

BY ORVILLE T. BARNETT*

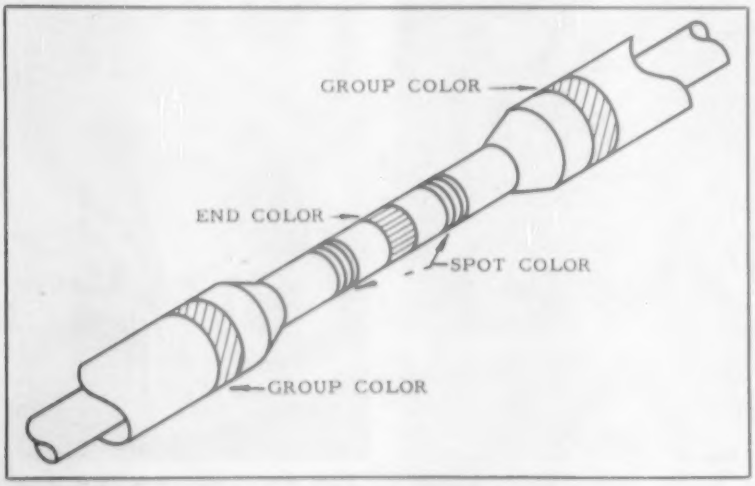
FILLER metals for joining have paralleled the complexities of a growing industrial civilization. The simple separation of welding electrodes from welding rods no longer prevails. By definition, welding electrodes were used for arc welding, welding rods for gas welding. Nothing could be more clear cut.

But today straightened and cut lengths of welding rod are often used with a tungsten arc in inert-gas welding. Or wire, in coil form, enters the joint as a consumable electrode for submerged-arc or inert-gas welding. For some time, coatings have been applied to coiled wire for open arc automatic welding. Now a hollow tube may replace the wire, with a flux filling the tube. In another filler metal, the wire carries a thin coating. And both the flux-filled tube in a carbon-dioxide atmosphere and the lightly fluxed wire in an argon atmosphere weld steel differently than has been done in the past.

With so many new filler metals, a welding engineer has trouble keeping abreast of the most promising processes. Extravagant claims for these metals and processes combine with honest disagreements among experts to thoroughly muddy the waters.

A systematic study of filler metals for joining necessitates certain ground rules. Nothing could be easier than suggesting welding, brazing and soldering as the foundation of all joining processes that use filler metals. Then a metal-by-metal treatment (such as joining Monel by welding, by brazing or by soldering) ought to settle the filler metal questions. It's a shame that nothing as straightforward as this approach can be adopted.

*Supervisor, Welding Research, Armour Research Foundation of the Illinois Institute of Technology, Chicago.



2—COLOR-marking location for center-grip electrodes

Master Processes

According to the American Welding Society's "Master Chart of Welding Processes,"[1] five methods—arc welding, brazing, flow welding, gas welding and thermit welding—use filler metals while the other three—forge welding, induction welding and resistance welding — use none. Arc welding and brazing are widely employed for joining metals. Gas welding and thermit welding enjoy certain more specialized applications. Flow welding, however, is little used. Furthermore, the basic welding processes exclude soldering which is being considered here. So the master welding processes do not satisfy the needs of a filler metal study.

Why not list all the filler metals and discuss them one by one? While this approach seems promising, there would be too much overlapping detail. Mild steel welding in terms of E6010 electrodes[2] would be comprehensive and definite. But low-alloy steel welding in terms of E7020 electrodes would be confusing because carbon-molybdenum of carbon-nickel steels might be welded with E7020 electrodes of different chemistry but similar mechanical properties. The

TABLE I—AWS-ASTM SPECIFICATION FOR FILLER METALS

Description	Year Issued	AWS Designation	ASTM Designation
Mild-steel arc-welding electrodes	1948	A5.1-48T	A233-48T
Low-alloy steel arc-welding electrodes	1943	A5.5-48T	A316-48T
Corrosion-resisting chromium and chromium-nickel steel welding rods and bare electrodes	1953	A5.9-53T	A371-53T
Corrosion-resisting chromium and chromium-nickel steel welding electrodes	1948	A5.4-48T	A298-48T
Aluminum and aluminum-alloy welding rods and bare electrodes	1954	A5.10-54T	B285-54T
Copper and copper-alloy welding electrodes	1953	A5.6-53T	B225-53T
Brazing filler metal	1952	A5.8-52T	B260-52T
Iron and steel gas-welding rods	1946	A5.2-46T	A251-46T
Nickel and nickel-base alloy covered welding electrodes	1954	A5.11-54T	B295-54T

American Welding Society and the American Society for Testing Materials are now revising AWS-ASTM Designation A223-48T to cover this point.

A braided filler metal of copper, iron and aluminum strands would necessitate a separate treatment from a solid aluminum bronze wire in an extreme case. Thus the individual study must be abandoned, too.

Filler metals will be classified for welding, for brazing, for soldering. Under these headings, the filler metals will be lined up by base metal group and by process. Throughout the study a critical appraisal of relative popularity will be attempted.

Welding is a process that produces a localized coalescence of metal wherein such union is produced by heating to suitable temperatures without application of pressure and with the use of filler metal. This special definition is a modification of the official AWS definition to fit a filler metal study. Also, the filler metal will be considered to have the same general composition as the base metal. (Notable exceptions are non-ferrous filler metals for welding cast iron.)

Brazing

Brazing covers a group of welding processes wherein joining is produced by heating to suitable temperatures above 800 F and by using a non-ferrous filler metal having a melting point below that of the base metals. In true brazing the filler metal is distributed between closely fitted surfaces of the joint by capillary attraction. Braze welding, too, will be considered.

Soldering resembles brazing except that temperatures are below 800 F. This is an arbitrary, but useful, dividing line. Some filler metals straddle the 800 F line, causing pedants much pain.

The greatest tonnage of filler metals is represented by arc-welding electrodes, with somewhat over 500,000,000 lb being produced in 1953. Automatic welding rod accounted for no more than 5% of the total, or 25,000,000 lb. Thus it seems reasonable to discuss arc welding electrodes as the first group of filler metals. And within this major group, mild-steel electrodes comprised about 80% of the total, so they will be reviewed first.

Any intelligent person who comes into the welding area of the metal-joining fraternity sooner or later asks the following question: "Why are there so many different kinds of arc welding electrodes?" It would be nice, of course, to have one electrode that would weld any type of mild steel. Actually the E6013 comes reasonably close to doing just that. But the many grades are justified by application requirements.

To avoid a dependence on brand names, the most recent NEMA (National Electrical Manufacturers Association) standard for arc-welding

TABLE II—RELATIVE POPULARITY OF MILD STEEL ELECTRODE GROUPS IN 1943 AND IN 1953

Classification Number	Rank in 1943	Rank in 1953
E6010	1	2
E6011	5	4**
E6012	2	1
E6013	4	3
E6015	*	5
E6016	*	
E6020	3	4**
E6030		

*Not made in 1943 **Virtually tied in volume.

electrode identification[3] will complement the AWS-ASTM filler metal specifications. But comparison charts with brand names will be prepared when appropriate and available.

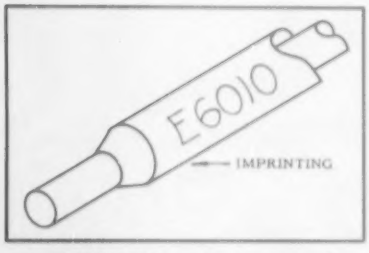
Color Code

By using the NEMA standard, anyone can tell the type of electrode by visual observation. A color-identification marking consisting of group, end and spot colors is most widely used (see Data Sheet No. 165, WELDING ENGINEER, June, 1954) while printing the AWS-ASTM classification number on the coating is also allowed. Printing the classification number on the coating is the most straightforward identification scheme, but only two producers are following this plan.

Figure 1 shows the location of color markings for end-grip electrodes, which represent over 95% of all electrodes used. For center-grip electrodes the color marking of Fig. 2 is used. Coating imprinting is depicted in Fig. 3. Where colors are employed, the end color (including no color) is most common; the spot color is next in popularity, and group colors are reserved for low-alloy steel, low-hydrogen low-alloy steel, d-c stainless steel, a-c/d-c stainless steel, copper and copper-alloy, nickel and nickel-alloy and unclassified electrodes.

The last group may be color marked or otherwise identified at the manufacturers' discretion using a group color—red—to show that these products have not yet been classified by AWS-ASTM. To be consistent with this plan, the fairly new iron-powder electrodes should have a red mark on the coating near the grip end.

At the beginning of 1955 there were nine specifications for filler metal (Table 1). Over half of these specifications were issued or revised in the past three years. A specification for surfacing filler metals, although in the course of preparation for several years, is not yet available, probably because of the complexity of this field. Nothwithstanding the excellent work done by specification committees, new products continue to race ahead of specifications.



3—IMPRINT for end-grip electrodes

TABLE III—MINIMUM TENSILE STRENGTH AND DUCTILITY REQUIREMENTS FOR ALL-WELD METAL TENSION TEST IN THE AS-WELDED CONDITION

Electrode Classification Number	Tensile Strength min., psi	Yield Point min., psi	Elongation in 2 in., min., per cent
E4510	45,000	not specified	5
E4520	45,000	not specified	5
E6010	62,000	52,000	22
E6011	62,000	52,000	22
E6012	68,000	55,000	17
E6013	68,000	55,000	17
E6015	68,000	55,000	22
E6016	68,000	55,000	22
E6020	62,000	52,000	25
E6030	62,000	52,000	25

Iron-Powder Electrodes

Perhaps this problem can be better understood from the recent history of iron-powder electrodes. Large-scale commercial promotion of a modified E6012 type produced in this country began in 1953 (contact electrodes announced in the 1940s did not take hold in the United States at that time). Shortly thereafter, a modified E6020 type was announced. Now there are modified E6016 and E6013 types. No specification-writing group could be nimble enough to keep abreast of all these changes. Nor would a two frequent change of specifications be desirable.

In 1943 this writer (using the pen name Harold Lawrence)[4] presented a series of articles on metallic-arc welding electrodes in *Steel*. So many changes have occurred in the intervening years that a new look becomes necessary. Table II, for instance, shows the changing popularity of mild steel grades. In a detailed discussion of each group, reasons for this shifting popularity will become clear.

Certainly anyone who welds mild steel should be familiar with the applicable AWS-ASTM specification. It covers two grades of lightly coated (really stabilized bare-wire) electrodes and eight grades of coated electrodes. In subsequent articles the fact that fourteen major producers do not make some grades and make two to four types of other grades will be explained. First, some idea of the classification system itself must be developed.

The prefix "E" in the electrode classification number indicates a metallic arc welding electrode which is consumed as filler metal. The next two numbers, "45" or "60", formerly signified the minimum tensile strength in the stress-relieved condition. Now, as Table III discloses, the ultimate strengths are in the 45,000, 62,000 or 68,000-psi minimum ranges and are based on the as-welded condition.

Number Code

The third number may be 1, 2, or 3. Number "1" suggests all positions of welding—flat, vertical, overhead and horizontal. Vertical and overhead welding is usually restricted to 3/16-in. maximum electrode diameter except for E6015 and E6016, where the maximum is 5/32 in. Number "2" means only horizontal fillet and flat positions, while "3" indicates flat position only.

The fourth digit, except when it is zero, has some significance in terms of coating design. For the E6010 is high cellulose sodium while the E6020 and E6030 are high iron oxide coatings. Fourth digit "1" is high cellulose potasium; "2" is high titania sodium; "3" is high titania potassium; "5" is low hydrogen sodium; and "6" is low hydrogen potassium.

These identities are roughly correct and are finding increasing practical usage along with welding sym-

(Continued on page 87)

New tube tester

THYRATRON tester he helped design and build is demonstrated by Ryan's George Pearson

BY BILL BROTHERTON

ELECTRICAL maintenance men at Ryan Aeronautical Co., San Diego, Calif., are saving time and trouble with a new tube tester, which takes the guesswork out of trouble-shooting. This device is used to test the large thyratron tubes used in all resistance-welding controls. Since 100 welding machines controlled by thyratrons are in constant use at Ryan, the tube tester is a valuable tool for pinpointing tube troubles and reducing machine down-time to a minimum.

The instrument was designed by electrical maintenance personnel and fabricated from used surplus materials. It contains relatively few parts —merely a transformer, grid circuit, resistors, voltage regulator tube, rectifier, ammeter and voltmeter. The ammeter has been modified to register from zero to 5 amp. The voltmeter has been altered to register from minus 20 to plus 20 volts.

With the new device, Ryan electricians can check the eight types of thyratron tubes used in welding equipment in the plant, including the 677, 672A, FG17, FG95 and FG57 types. Within a few minutes, the tester will positively indicate control characteristics of a tube.

Thyratron tubes are the largest and most expensive types used in welding-machine control panels. They cost between $8 and $55, depending upon size and type. Called "trigger tubes" by electricians, they are actually electronic switches which control the large amounts of electricity needed to weld metals. With thyratron tubes, it is possible to control large voltages, say 3,000 volts, with small voltages of only 5 or 10 volts and control the large voltages within accurate limits.

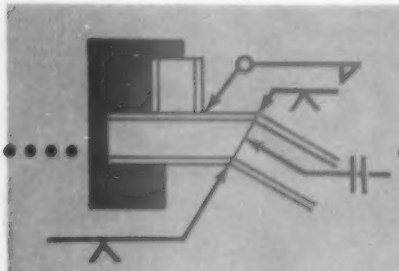
Because tube testers are not available commercially for testing these large thyratron tubes, the company's electricians previously had to check such tubes by trial-and-error methods. A suspected tube in a welding machine was replaced with a new one; if the machine then worked properly, it was assumed that the removed tube was malfunctioning. The used tube was not thrown away, however, because it might be able to work well in another machine where voltages were slightly different. These tubes are so expensive that it is inadvisable to throw one out just because it fails to operate in one particular machine.

If the welding machine failed to operate correctly when the thyratron tube was replaced, the maintenance man was then faced with several questions. Was the new tube any good? Was the trouble elsewhere? Was it both the tube and some other defect that were causing the machine's behavior?

Like most electronic tubes, thyratrons consist of a cathode "gun" firing a stream of electrons at a target plate. Between the cathode and plate, a grid is interposed and charged with electricity. By impressing the proper voltage on this grid, it is possible to repel the flow of electrons to prevent them from reaching the plate. In this way a sensitive switch is obtained.

To test a thyratron tube, it is placed in the tester and a voltage of 600 volts is impressed between the cathode and plate. The grid voltage is then varied by means of a potentiometer. Ryan has found that these tubes will operate just as reliably for test purposes on 600 volts as they will under actual operating conditions of 2,000 volts. Almost all of the thyratrons used at Ryan will "fire" when the grid voltage is varied between zero and 6 volts. With the tester, it is possible to see exactly where the tube cuts in and off and the voltage at which the tube will "fire" the currents required by the welding machine.

By using the new tester, Ryan electricians have been able to throw out many thyratrons that were held in storage because of doubtful quality. Other used tubes have been classified for use in machines with conditions suitable for their operation. Most important: the tube tester permits the immediate qualification of questionable thyratrons in malfunctioning machines and allows the trouble-shooter to rule out that source of trouble with certainty and dispatch.



the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Are welding fumes harmful?

Question:

Does welding on galvanized steel and non-ferrous metals affect the health of weldors?

Answer:

Generally speaking welding fumes present no health hazard. But welding fumes are the hazard that weldors most frequently think of in connection with their working conditions. The average weldor feels that through adequate eye and face protection he is able to avoid the effects of infrared and ultraviolet rays of the welding arc or flame, but he is not so sure he is protected from the fumes resulting from these welding operations.

The fumes from most arc or gas welding and cutting applications are not harmful under normal working conditions. Of course, a heavy concentration of fume should be avoided, but such concentrations as a rule can occur only when welding is done in a confined space. In these instances, artificial ventilation should be used.

Lead, Zinc and Cadmium

When welding is done on lead, galvanized steel or cadmium-plated pieces, there is a likelihood of harmful fumes developing. Lead and cadmium are particularly dangerous. The zinc fumes produced from brazing operations or from welding and cutting of galvanized material are dangerous, but to a lesser degree.

The inhalation of cadmium fumes produces a lung irritation. These fumes probably present the most serious health hazard encountered in welding inasmuch as cadmium is now being widely used as a rustproof protective plating on steel and is also used to some extent as an alloying agent in steel. When welding a cadmium-bearing material, good ventilation is absolutely necessary. For complete protection, the weldor should wear an air-supplied helmet. It should be remembered, however, that to provide proper ventilation, fume exhausters are a *must* on such jobs.

The toxicity of lead to the human system has long been known. Lead fumes are even more dangerous than those of cadmium, but, fortunately, lead-bearing materials are not frequently encountered in welding operations. While lead fumes are generated in most soldering operations, their likelihood of endangering health is materially lessened by the low content of lead in most operations.

Zinc Fumes

Zinc fumes are encountered in braze-welding, in the welding of galvanized steel and in the welding of brasses. They are by no means as dangerous as often believed, but they will give a weldor an attack of the illness known as "zinc chills" or "metal fume fever". While this experience is most unpleasant, it is generally not serious and rarely lasts for longer than 24 hours.

Some weldors will tend to develop an immunity after an attack of zinc chills and will not experience another attack as long as they continue to work in these fumes—unless there has been a prolonged lapse of exposure. Weldors who fail to develop such an immunity should not be placed upon such work as they will experience continued illness.

Medical records fail to reveal any influences detrimental to the weldor's health that may be attributed to welding fumes. During the war years when thousands of weldors were examined along with other industrial workers, it was found that their health was as good or better than the average. As for the tendency of welding fumes to aggravate colds, as has been claimed, it was found that weldors frequently develop resistance to colds.

Medical records likewise reveal that welding has little effect on those who have arrested or active cases of tuberculosis. Industrial doctors have had an excellent opportunity to watch such conditions during recent years, and medical reports seem to indicate that welding fumes are unlikely to have any effect on the weldor's lungs.

Wherever welding is carried on, precautions should be taken to avoid the irritating effects of welding fumes by providing adequate ventilation. When welding in a confined area, a fume exhauster should be employed to carry fumes away from the operator. Where the fumes are of a toxic nature, such as lead, cadmium or zinc fumes, it might be well to protect the weldor with a respirator, an oxygen mask or a helmet of the supplied-air type. These precautions must certainly be taken if ventilation is inadequate.

Down through the years the offices of WELDING ENGINEER have been consulted by thousands of persons seeking the answers to specific problems relating to joining and severing of metals. It has always been the policy of WELDING ENGINEER to seek out the answers for these readers. Since many of the questions are of general interest, it has now been decided to publish some of them in this new department—the welding clinic. Your questions are invited.

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Inside view showing [illegible] of "Series 600" Helmets for extra protection to welder's neck from flashes and reflected glare.

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MODERN Chemistry Building at IIT was site of first annual Midwest Welding Conference, sponsored jointly by Armour Research Foundation and Chicago Section of AWS

DURING break, Joe Magrath (right), AWS national secretary, and Amel Meyer, section chairman, are shown display by O. T. Barnett, ARF welding research supervisor

Midwest welding conference

CHICAGO was their destination, and they came from Los Angeles, from Birmingham, from New York City, and from other distant points. They came to attend the first Midwest Welding Conference on Feb. 8 and 9. More than 180 persons registered.

Spokesmen for Armour Research Foundation of Illinois Institute of Technology, which co-sponsored the meeting with the Chicago Section of the American Welding Society, said the two-day conference produced "gratifying results." The event will be held again in 1956 and is expected to become an annual affair.

Visitors were almost unanimous in expressing a wish for more of these topics next year: carbon dioxide as a shielding gas and welding design.

Following a welcoming address by Dr. John T. Rettaliata, president of ARF and IIT, the audience heard Ernest C. Osborne, quality control manager of Caterpillar Tractor Co., advocate statistical quality control methods to achieve high standards. But he warned that these methods involve more than the simple gathering of data and application of mathematical formulas.

Quality standards in welding must be maintained at high levels, Osborne said, for "today's quality will not sell in the markets of tomorrow."

Perry C. Arnold, welding engineer for Chicago Bridge and Iron Co. described efforts to establish a field welding laboratory for his firm. The laboratory was used to conduct manual welding tests on large-sized plates, for research work on automatic and semiautomatic welding equipment, and for training weldors.

A. F. Busick, Jr., of Marion Power Shovel Co., told how a new alloy steel and modern welding design have brought about a tremendous weight saving. A 45-cu-yd shovel, with payload, weighs the same as a 35-yd shovel, with payload—all because of these two factors.

Other subjects on the program included brazing, inert-arc welding, resistance welding and the methods of joining titanium. Chairmen of the four sessions were John J. Chyle, director of welding research, A. O. Smith Corp.; Leslie S. McPhee, welding supervisor, Whiting Corp.; William H. Munse, University of Illinois; and Amel R. Meyer, chief of welding research, Graver Tank & Mfg. Co.

Guiding force behind the inaugural event was Orville T. Barnett, the Foundation's supervisor of welding research.

AWS First Vice-President J. J. Chyle is second from left. At left is Jay Bland, Chicago Section's second vice-chairman; Section secretary, L. C. Monroe, is between Chyle and Barnett

PORTION of crowd is pictured during question-and-answer period following talk by John H. Blankenbuehler, design engineer of The Hobart Brothers Co., who spoke on power sources for arc welding

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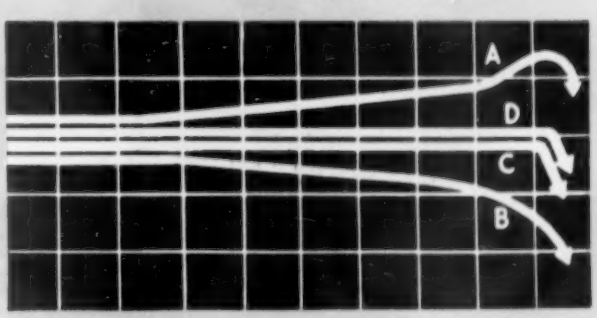

Performance Graph of Various Types of Regulators

(a) Typical stem-type single-stage regulators deliver increasingly higher rate of flow as cylinder pressure drops. (b) Typical nozzle-type single-stage regulators deliver progressively lower rate. (d) The *Torchweld* Regulator delivers the same uniform flow as (c) two-stage regulator, but at much lower cost and with fewer working parts to wear out and cause trouble. *Torchweld* has all the advantages and none of the disadvantages of single- and two-stage regulators.

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AWS Specifications B295-54T—Coated Nickel Electrodes

TABLE I.—CHEMICAL COMPOSITION REQUIREMENTS OF DEPOSITED WELD METAL.

NOTE 1.—Analysis shall be made for the elements for which specific values are shown in this table. If, however, the presence of other elements is indicated in the course of routine analysis, further analysis shall be made to determine that the total of these other elements is not present in excess of the limits specified for "other elements" in the last item in the table.

NOTE 2.—Single values shown are maximum percentages, except where otherwise specified.

Element	Ni-Cu E3N10	Ni E3N11	Ni-Cr-Fe E3N12	Ni-Cu-Al E3N14	Ni-Cr-Fe-Ti E3N19	Ni-Mo E3N1B E4N1B	Ni-Mo-Cr E3N1C E4N1C	Ni-Cu E4N10	Ni E4N11	Ni-Cr E4N13
Carbon	0.40	0.75	0.15	0.45	0.25	0.12	0.12	0.15	0.10	0.15
Manganese	4.00	0.75	1.50	4.00	1.00	1.00	1.00	2.50	0.75	1.50
Iron	2.50	0.75	11.00	2.50	11.00	4.00 to 7.00	4.00 to 7.00	2.50	0.75	4.00
Phosphorus	...	...	...	...	...	0.040	0.040	...	...	...
Sulfur	0.025	0.02	0.015	0.025	0.015	0.030	0.030	0.025	0.02	0.015
Silicon	1.00	1.25	0.75	1.25	1.00	1.00	1.00	1.25	1.25	0.75
Copper	remainder	0.25	0.50	remainder	0.50	...	...	remainder	0.25	0.50
Nickel	62.00 to 70.00[a]	92.00 min[a]	68.00 min[a]	60.00 to 68.00[a]	68.00 min[a]	remainder	remainder	62.00 to 70.00[a]	93.00 min[a]	70.00 min[a]
Cobalt	...	...	...	...	...	2.50	2.50	...	...	...
Aluminum	1.50	1.00	...	1.00 to 4.00	0.10 to 1.00	...	...	0.75	1.00	...
Titanium	1.00	0.50 to 4.00	...	1.00	1.00 to 2.75	...	...	1.50	1.00 to 4.00	...
Chromium	...	...	13.00 to 17.00	...	12.50 to 17.00	1.00	14.50 to 16.50	...	...	17.50 min
Columbium plus tantalum	...	...	1.5 to 4.00	...	4.0 × Si min[b]	...	...	3.00	...	1.5 to 4.00
Molybdenum	..	...	...	...	...	26.00 to 30.00	15.00 to 18.00	...	...	...
Vanadium	...	...	...	...	...	0.60	0.35	...	...	...
Tungsten	...	...	...	...	...	...	3.00 to 4.50	...	...	...
Other elements (total)	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50

[a] Includes incidental cobalt.

[b] Except that for 5/64 and 3/32 in. diameter electrodes, columbium plus tantalum may be 1.00 to 2.50 per cent.

TABLE II.—MINIMUM REQUIREMENTS OF SHORT GAGE TENSION TEST.

Electrode	Base Metal		Tensile Strength, min, psi	Condition
E3N10	Ni-Cu (Monel)	ASTM B 127	70 000	as welded
E3N11	Ni (Nickel)	ASTM B 162	55 000	as welded
E3N12	Ni-Cr-Fe (Inconel)	ASTM B 168	80 000	as welded
E3N14	Ni-Cu-Al ("K" Monel)	MIL-N-17506 (Ships)	100 000[a]	age hardened
E3N19	Ni-Cr-Fe-Ti (Inconel "X")[b]	AMS 5542	115 000[b]	age hardened
E3N1B and E3N1C	Ni-Mo (Hastelloy B) and Ni-Mo-Cr (Hastelloy C)	plate under 3/16 in.	115 000	as welded
		plate 3/16 to 3/4 in., incl.	100 000	
		plate over 3/4 to 1 1/2 in., incl.	90 000	as welded
	Steel	ASTM A 285		

[a] Age hardened at 1100 F for 20 hr followed by furnace cool to 900 F and air or furnace cool to room temperature.

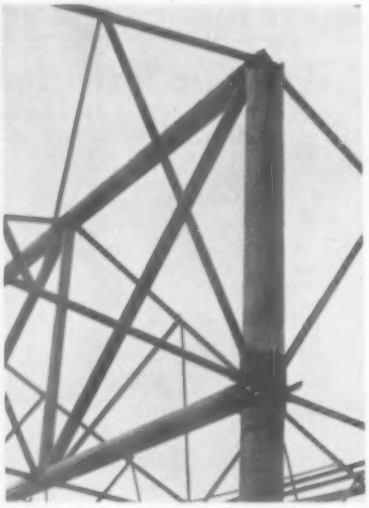
[b] Age hardened at 1300 F for 20 hr and air cooled to room temperature.

TABLE III.—SUMMARY OF TEST REQUIREMENTS.

Electrode	Sizes	Chemical Analysis		Transverse Tension Test		Guided-Bend Test		Fillet Weld Test	
		Position	Base Plate	Position	Base Plate	Position	Base Plate	Position	Base Plate
E3N10	5/64, 3/32	flat	Ni-Cu	not required	...	not required	...	not required	...
	1/8, 5/32	flat	Ni-Cu	all	Ni-Cu	all	Ni-Cu	all	Ni-Cu
	3/16	flat	Ni-Cu	flat	Ni-Cu	flat	Ni-Cu	HF[a]	Ni-Cu
E3N11	5/64, 3/32	flat	Ni	not required	...	not required	...	not required	...
	1/8	flat	Ni	all	Ni	all	Ni	all	Ni
	5/32, 3/16	flat	Ni	flat	Ni	flat	Ni	HF[a]	Ni
E3N12	5/64, 3/32	flat	Ni-Cr-Fe	not required	...	not required	...	not required	...
	1/8, 5/32, 3/16	flat	Ni-Cr-Fe	flat	Ni-Cr-Fe	flat	Ni-Cr-Fe	HF[a]	Ni-Cr-Fe
E3N14	5/32	flat	Ni-Cu-Al	not required	...	not required	...	not required	...
	1/8, 5/32	flat	Ni-Cu-Al	all	Ni-Cu-Al	all	Ni-Cu-Al	all	Ni-Cu-Al
	3/16	flat	Ni-Cu-Al	flat	Ni-Cu-Al	flat	Ni-Cu-Al	HF[a]	Ni-Cu-Al
E3N19	5/64, 3/32	flat	Ni-Cr-Fe-Ti	not required	...	not required	...	not required	...
	1/8, 5/32	flat	Ni-Cr-Fe-Ti	flat	Ni-Cr-Fe-Ti	flat	Ni-Cr-Fe-Ti	HF[a]	Ni-Cr-Fe-Ti
E3N1B	5/64, 3/32	flat	Ni-Mo	not required	...	not required	...	not required	...
	1/8, 5/32, 3/16	flat	Ni-Mo	flat	Ni-Mo	flat	Ni-Mo	HF[a]	Ni-Mo
E3N1C	5/64, 3/32	flat	Ni-Mo-Cr	not required	...	not required	...	not required	...
	1/8, 5/32, 3/16	flat	Ni-Mo-Cr	flat	Ni-Mo-Cr	flat	Ni-Mo-Cr	HF[a]	Ni-Mo-Cr
E4N10	all sizes	flat	Ni-Cu	not required		flat	steel	not required	
E4N11	all sizes	flat	Ni	not required		flat	steel	not required	
E4N12	all sizes	flat	Ni-Cr-Fe	not required		flat	steel	not required	
E4N1B	all sizes	flat	Ni-Mo	not required		flat	steel	not required	
E4N1C	all sizes	flat	Ni-Mo-Cr	not required		flat	steel	not required	

[a] HF = horizontal fillet.

1–FACTORY in England was built with welded tubular steel. This is view of two bays–one 40 ft and one 60 ft long. Main columns are made from 16-in. tubing



2–CLOSE-UP of steelwork shows junction of 120-ft-span lattice girder with main column

Tubular-steel construction

BY WALTER SEKULES

WHEN an English company, which makes tubular-steel structures, needed a new plant to expand production, it decided to build for itself an all-welded, tubular-steel frame factory similar to the products it fabricates for others. By using its own skilled workers, the firm, Tubewrights Limited, a subsidiary of Stewarts & Lloyd, Ltd., saved considerable time and money.

Tubes were delivered to the site, at Kirby near Liverpool, in approximate lengths and were shaped, welded and erected by Tubewrights' own staff. Once delivery of the components was made, the welding and erection of the steel frame—which covers an area of 141,000 sq ft—took 30 men four and a half months to complete. Six men were employed on preparing the material, ten worked on fabrication and the remainder on erection. All joints throughout the structure were welded; bolts were used only to anchor the columns to foundations.

Tubewrights needed large areas of floor space unobstructed by internal columns. Design and construction of the tubular frame allows floor spaces clear of all obstruction up to 360 ft long by 120 ft wide. The plant has three bays and an annex. The main shop is 360 ft long, 360 ft wide and 17 ft high (to the eaves). It consists of six intermediate bays with 40-ft spans and two outside bays with 60-ft spans (photo 1). One of the latter spans is extended to form the receiving bay.

The roof structure rests on 21 main supporting columns, each weighing one ton. They are made from 16-in tubes (the largest size seamless tube made in England for oil pipes) and support the 21 latticed girders, each of which spans 120 ft (photo 2). Weighting 6¼ tons each, these girders carry the roof trusses. The 40-ft-span roof trusses are of the butterfly type, glazed on both slopes, while the 60-ft span outer bays have flat-pitched trusses with glazing at the apex.

Individual girders and roof trusses were prefabricated prior to erection, and the whole structure was erected with the aid of two mobile cranes. It took seven minutes on the average to place the girders in position.

Except for the glazing purlins, which are rolled angle sections, the superstructure is made entirely of welded tubing. The roof is covered with aluminum decking over insulation board and two layers of felt. The sides are clad with asbestos-protected metal sheeting.

Total weight of steel used in the finished structure was 415 tons, which is equivalent to 6½ lb of steel per square foot of floor space. This weight is estimated to be 40% less than a similar design using riveted or bolted sections. Allowance for loads carried by the roof structure, to provide for conveyors, was equivalent to a load of 20 psf floor area, an increase of nearly 100% over the normal dead and live load requirements. Welding sets will be mounted overhead, with power lines passing along the trusses, thus clearing floor space.

Small-scale production started in one part of the plant within three months after assembly of material on the empty site. The new plant will mass-produce tubular-steel roof trusses, bridges, jibs, gantries, transmission towers, cable drums, gates, fencing, and other equipment for materials handling, agriculture, mining and quarrying.

Stewarts & Lloyd point out that the design, development and production of standard tubular-steel structures were pioneered in England and now form a new type of export unknown before the war. One Stewarts & Lloyd subsidiary, for instance, has exported tubular-steel prefabricated structures valued at more than $11,000,000 to 72 countries since 1950.

The company claims this rapid development has been due entirely to the new welding techniques perfected during the last decade.

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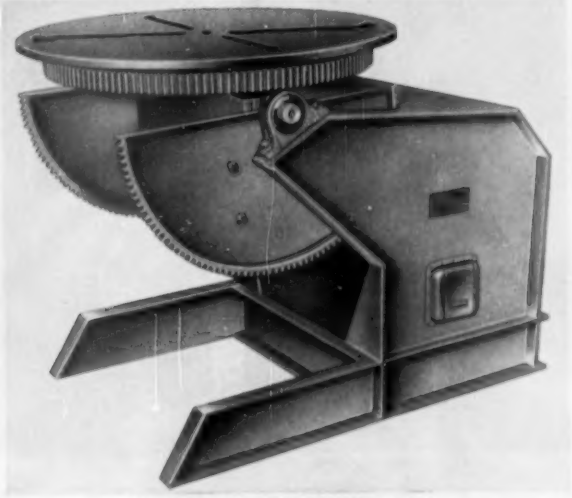

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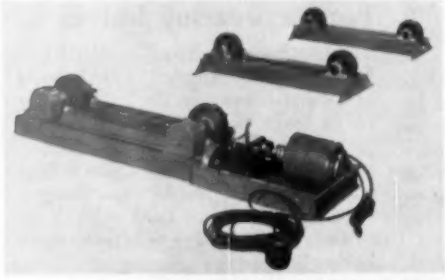

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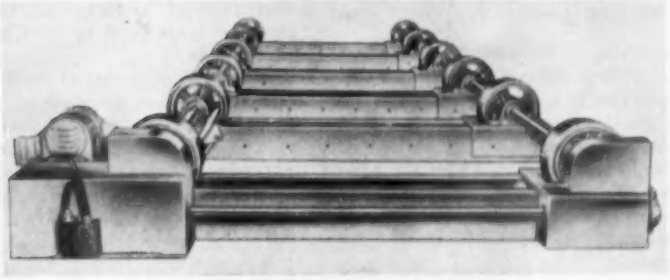

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Tennessee: Chattanooga—Brooks Welding Supply Co.
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on the job . . .

Courtesy A. M. Byers Co.

WELDOR uses E-6012 electrode on wrought-iron pipe

—Courtesy Ampco Metal, Inc.

DEPOSIT of hardfacing material is applied with a weave technique, then machined

Sewage pipe

Selection of a material that lends itself to low-cost maintenance per-year-of-service is a common consideration of engineers who specify for public works projects. This is particularly true of sewage lines where the corrosive nature of the application and the inaccessability of the piping are two factors that influence maintenance expense.

For huge sewage lines serving Bay Village, Ohio, Cuyahoga County sanitary engineers selected corrosion-resistant wrought iron. The pipe—48 in. in diameter—is installed in approximately 270 ft of the Bay Village sewage system.

More than 37 tons of ½-in. wrought iron plate was required by Morgan Steel Products, Inc., to fabricate the large pipe in its Cleveland shop.

The seven segments of the Bay Village sewage line are each welded by the manual arc process on the outside with three passes of E-6012 electrodes (3/16-in. diameter) to a depth of ½ in. There is a reinforcing weld in the interior of the pipe. Weldor in picture above at left is making it.

Welds were checked for compliance with standards of the American Welding Society by the James H. Herron Company Laboratories, Inc., Cleveland, as required by the Cuyahoga County Sanitary Engineer John H. Puzenski and Assistant Engineer C. Riley Westmoreland. Installation was handled by The Utilities Construction Co., Cleveland.

Longer wearing knives

The Carthage Machine Co., Carthage, N. Y., was confronted with reports of excessive wear on the knife holder of its 96-in. wood chipper, used by paper mills. The difficulty was overcome by overlaying the knife holder with aluminum bronze, plus using a removable insert of hard steel.

Today, Carthage overlays these knife holders by means of ¼-in. coated aluminum-bronze electrodes conforming to AWS-ASTM Specification E Cu A1-D. Since the holders are made of mild steel, no serious problems are encountered in welding. The deposit is applied with a weave technique to a thickness sufficient to allow for a finish-machined overlay 3/16 in. thick.

Though the knife holders are now overlaid at the manufacturer's plant, they can also be maintained in the same manner in the field when they become worn in service.

Tree guard

A tree may grow in Brooklyn, but it seems hard for trees to grow in San Francisco. To protect young trees, which, it is hoped, will some day beautify the latter city's streets, pipes and pipe welding have been called into play.

First, a piece of 2-in. pipe is bent into a "U" shape. Two pieces of 1½-in. pipe are then welded to it to make the guard. Should a reckless motorist careen over the curb, the guard takes the beating and not the tree.

* * *

Armco Steel makes aircraft panel filler

Cellular stainless steel mat, a honeycomb filler sandwiched between two steel sheets to make an aircraft panel, is being developed for jet planes, rockets and missiles by Armco Steel Corp. The honeycomb wall material is bonded into panels with adhesives or by brazing.

MALLORY

Standard Electrode Holders *make tough welding jobs easy*

IF YOU ARE LOOKING for a way to weld around corners, into channels or at other hard-to-reach spots, there's a good chance that you will *not* require a special electrode holder . . . with its extra cost.

A Mallory standard holder can probably do exactly the job you need. This diversified line offers you the variety of custom-fitted designs with the economy and ready availability of standard stock items. Included are offset, paddle type, low inertia, straight, swivel head, universal and close-coupled types . . . in a wide range of sizes and in light, standard and heavy duty pressure ratings.

Coupled with this range of holders Mallory offers you scores of different shapes of welding electrodes . . . an unlimited number of combinations from which to choose. You'll save both the cost and the time of designing and producing special types . . . and you'll profit, too, by improved performance that is the result of Mallory's quarter century of experience in resistance welding alloys and materials.

Our Resistance Welding Catalog lists the complete line of Mallory electrodes, holders, dies, castings and forgings. Ask your local distributor for a copy, or write to Mallory today.

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario

Expect More... Get More from

MALLORY

P. R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

STOCK ELECTRODES

Hundreds of shapes and sizes are available in stock . . . with round water holes or the exclusive Mallory fluted cooling hole for longer life between dressings. Save you both cost and delivery time.

STANDARD ELECTRODES

Odd-shaped electrodes you consider "specials" may well be standard items for Mallory . . . can be made quickly with existing tools, in a wide range of single-bend, double-bend and irregular shapes.

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

new products . . . . . USE CARD ON PAGE 101

SPOT-arc process is much like Tig

PENETRATION: up to 2-in. steel

FIXTURE has 4-station turntable

Spot arc welder

SPOT arc welder is said to be ideal in sheet welding applications working from only one side of sheet. Self-timing device eliminates danger of burn-through. "Spot Arc" process is basically same as Tig (tungsten inert-gas) process but arc time is measured accurately so that only puddle of molten metal is formed, it is said. The welder is complete with gas controls, self-timer, heavy-duty magnetic contractor remote-control circuit, and can be attached to any a-c welding power source of 300 amps. *Mid-States Welder Mfg. Co.*

Circle No. 50.

* * *

Soldering unit

HEAVY-duty handpiece for use with "Wassco Glo-Melt" resistance-soldering power units is claimed to incorporate efficient heat-blocking fin arrangement with a split-collet soldering tip holder. Transfer of the intense heat generated at the tip when soldering is virtually eliminated, according to manufacturer.

Handpiece weighs 8-oz, is 7 in. long and accepts "Wassco" ½-in. diameter soldering tips. *Wassco Electric Products Corp.*

Circle No. 51.

* * *

Wheel adapter

WITH addition of two new sizes, a complete line of adapters is now available for use with the "Sand-O-Flex" brush-backed deburring wheels. The adapters make it possible to use these wheels on any diameter shaft up to 1¼ in.

Normally, the sanding heads will fit any machine-shop spindle, but in cases where spindles are undersize, oversize or threaded, adapters are necessary. They are available either for plain or threaded spindles. *Merit Products, Inc.*

Circle No. 52.

* * *

X-ray unit

(center photo)

NEW 160-kvp portable X-ray unit for industrial radiography is capable of penetrating 2 in. of steel. Components are a tube unit weighing 120 lb., a control unit, 60 lb. and lightweight connection and power cables. Unit operates on 110 and 220 volts, independent of separate transformers. Focal spot in the centrally located X-ray tube is 1.5 mm. *Holger Andreasen, Inc.*

Circle No. 53.

* * *

Electrode

LOW-cost non-machineable cast iron electrode is primarily for repair and reclamation and is characterized by as-welded high strength. Known as "No. 6," this electrode is applicable with a-c or d-c welders and enables dense, sound welds to be made in all positions, it is said. It gives a good color match and has little scatter loss, according to manufacturer. Tensile strength is 60,000 psi. Available in 3/32-in., ⅛-in. and 5/32-in. core sizes. Standard packages are 50 lb. *All-State Welding Alloys Co., Inc.*

Circle No. 54.

Welding fixture

MULTIPLE-spindle, submerged-arc welding fixture handles six types of tractor steering spindles. "Multimatic" has four-station turntable, variable speed drive (ratio 15 to 1), permitting quick change in diameter, and adjustable head mounting. "Hot start" feature eliminates high frequency requirements. *Automatic Welding Co.*

Circle No. 55.

* * *

Brazing alloys

SILVER brazing alloys and flux for all types of production jobs comprise the new "Aircosil" line. Alloys are available in various forms—rod, wire, sheet, rings and gaskets, as well as special shapes. Alloys of special composition are also available. The silver brazing flux is in paste form and will not freeze, crystallize or separate, and the residue rinses off easily in hot water, manufacturer states.

"Aircosil" is claimed to be the first and only silver brazing alloy to be sold by avoirdupois weight (16 oz per pound), rather than troy ounces (12 oz per pound.) *Air Reduction Sales Co.*

Circle No. 56.

* * *

Thyratron

GAS and mercury-vapor thyratron "NL-730" has long life, quick start, wide temperature limits, manufacturer states. This 3.2A d-c thyratron was designed for motor speed control and regulated rectifier applications. *National Electronics, Inc.*

Circle No. 57.

CORROSION-RESISTANT EVERDUR QUADRUPLES LIFE OF DEGREASING TANK

WELDING CHANNELS on side of tank with EVERDUR-1010 Welding Rods. Fabricated in 3 sections, this tank was welded and assembled by Storts Welding Company, Meriden, Conn.

DEGREASING TANK 30′ long, 6′ high and 2½′ wide and made of ¼″ EVERDUR-1010 Sheet.

Easy to work and weld, Everdur also proves adaptable to money-saving fabricating methods

Trichlorethylene—the solvent used in this degreasing tank—may break down to form hydrochloric acid when heated in the presence of moisture.

So serious is the corrosion problem that tanks made of ferrous materials, for example, have lasted no more than two or three years in this service.

The manufacturer's problem? To find a material that would not only resist this acid corrosion but also lend itself to low-cost fabricating methods.

After consulting with Anaconda's Technical Department, the manufacturer decided to fabricate the tank of EVERDUR* — ANACONDA'S Copper-Silicon Alloy. Fabricating costs were low and tank life is estimated to be over twelve years.

Corrosion-resistant. EVERDUR resists corrosive attack by hydrochloric acid. It can't rust. And it is unusually strong, tough and fatigue-resistant. What's more, EVERDUR is . . .

Easy to work. You can work and form EVERDUR plate hot or cold. EVERDUR alloys are also available for forging and machining. Weldability? You'll find EVERDUR . . .

Easy to weld, too. The inert-gas shielded-arc methods produce high-quality welds at good speeds and moderate cost, and with minimum distortion. This tank was welded with the argon-shielded tungsten arc, using ⅛″ and 5/32″ diameter Everdur-1010 Welding Rods.

EVERDUR Copper-Silicon Alloys are available in plates, sheets, rods, wires, tubes, electrical conduit and casting ingots. Your own equipment or corrosion problem will be given careful attention by our Technical Department. Write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

*Reg. U. S. Pat. Off. 44127

EVERDUR

ANACONDA®

COPPER-SILICON ALLOYS

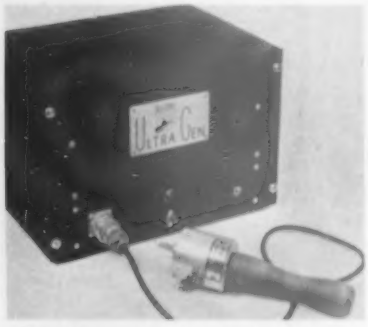
Strong • Weldable • Workable • Corrosion-Resistant

Arc welder

"MODEL 165A" a-c arc welder was designed for use as portable welder in plant maintenance and construction and can be used in continuous production welding. Voltage characteristics make arc striking and welding easy, according to manufacturer. Unit can also be used with carbon torch for heating, soldering, brazing and welding of brass and aluminum. *Illumi Tronic Engineering Co.*

Circle No. 58.

* * *



Fluxless soldering

"SOLDER-Gun" is a magneto-strictive transducer driven by electronic generator for cleaning surface oxides beneath molten solder on aluminum and other materials. Wetting is completed before re-oxidation occurs, eliminating need for flux and creating stronger bond and superior conductivity, according to manufacturer.

Generator operates from 60-cycle, 115-volt source. Bench space is 10 in. by 14 in. Entire unit weighs 50 lb and is portable. Solder pot for fluxless tinning and small batch mixer are available. *Alcar Instruments, Inc.*

Circle No. 59.

Abrasive cone

CONVENIENCE and instant easy operation is provided by threaded steel bushing inserted in and bonded to rubberized abrasive cone, giving tight union fit. Replacements can be screwed on grinder spindle quickly. Two sizes of cone available: "No. 1358," 1¾ in. long by 15/16 in. diameter and "No. 1359," 1¼ in. long by ⅞ in. diameter. Both are designed to fit ¼-in. mandrel and come in coarse, medium, fine and extra-fine grit textures. *Cratex Mfg. Co.*

Circle No. 60.

* * *

Heavy-duty drill

ELECTRIC hand drill of pistol type is said to afford easier power drilling. This ¼-in. "Series B" drill has 2.8-amp, 115-volt a-c/d-c universal motor. Compound reduction gearing gives maximum power. Better control is given by grip that fits snugly into hand palm. Trigger-type safety switch is easily operated by little finger. Switch lock button keeps switch "on." Removable inspection cover gives quick access to motor simplifying inspection, cleaning and maintenance.

Available in six models of chuck capacities of ½ in., 5/15 in. or ⅜ in. Drill weighs 3¼ lb and is 9½ in. long overall with spindle offset of ¾ in. Depending on model, chuck speeds range from 650 to 5,000 rpm. *Milwaukee Electric Tool Corp.*

Circle No. 61.

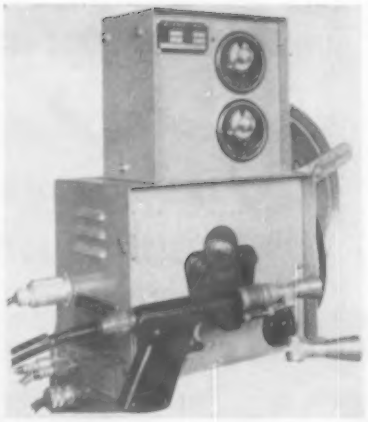
* * *

Mist collector

THIS "Electro-Staynew" mist collector, designed for mounting on or near high-speed grinding and cutting machines, is said to remove over 90% of oil mist and smoke, returning clean air. Unit construction combines ionizing and collecting chambers simplifying upkeep. Three easily installed models are available. *Dollinger Corp.*

Circle No. 62.

For more information use card on page 101

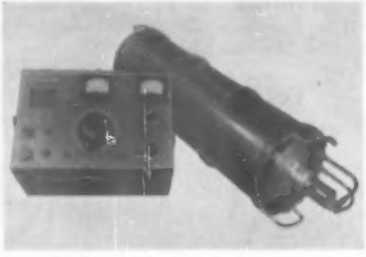


Welding control

DESIGNED for use with the Mig (metal inert-gas) welding process and constant-potential power source, this easily installed spot and tack welding control provides automatically timed cycle. For use with "SWM-2" units, the control is housed in a compact steel case mounted on top the control box. The control consists entirely of standard heavy-duty industrial electrical timers and relays selected for long life and low maintenance requirements, according to manufacturer. *Glenn Co.*

Circle No. 63.

* * *

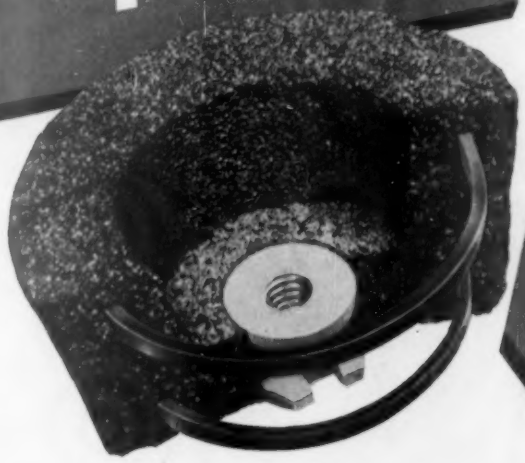


Portable X-ray

UNIT for complete circumferential X-ray of weldments and construction of pipe lines, boilers, tanks and similar equipment is portable. Lightweight unit, called the "X-Tron 180," contains a specially designed transformer and X-ray tube and a high-voltage generator that delivers 180 kv and 10 ma continuously. The unit will penetrate 2⅛ in. of steel and will traverse a pipeline greater than 12 in. in diameter. In addition, it can be placed in the center of a ring of castings so that they all can be X-rayed at one time, manufacturer says. Control panel is semiautomatic and can be operated by relatively inexperienced personnel. All controls are weatherproof. *Mitchell Radiation Products Corp.*

Circle No. 64.

really NEW... ... FOR PORTABLE GRINDERS



"GRINDAWAY*" wheels with SAFETY RINGS which grind away

. . . they assure you of increased safety, because they reduce the danger of "bursting"

If you have ever been around when a grinding wheel "explodes", you know what can (and often does) happen . . . it's not only frightening, but can be very dangerous.

But now, we of Colonial, have, after many years of grinding wheel experience, developed the "GRINDAWAY" reinforced resinoid high speed wheel for portable grinding. This wheel not only offers a greatly *increased safety factor,* but in addition, is the same high quality wheel that Colonial has always manufactured.

The "exclusive" feature of this new wheel is the reinforced rings, which have a higher Tensile strength than steel . . . and, these rings are inserted right where the reinforcement is needed: in the actual grinding portion of the wheel . . . this is only made possible, because they abrade away as the wheel wears through them.

Colonial offers "GRINDAWAY" Safety Wheels in three types: straight, recessed, and flaring cup . . . all available *without any premium cost.*

Of course, Colonial continues to offer industry a complete line of regular Vitrified and Resinoid wheels for every grinding need, plus their personalized grinding wheel Engineering Service.

Write, wire or phone Colonial today regarding your grinding problems . . . You will receive prompt, courteous attention and worth-while advice.

*Patent applied for

FREE LITERATURE UPON REQUEST

NOTE: In testing laboratories GRINDAWAY wheels have been purposely cracked, and then run at speeds considerably higher than normal operating speeds "without bursting".

COLONIAL ABRASIVE PRODUCTS CO.
SIXTH AND HARRY STREETS
CONSHOHOCKEN PENNSYLVANIA

How AMSCO® helps you HARDFACE MORE EFFECTIVELY

The complete line of 15 Amsco hardfacing rods represents a selection of the toughest, hardest alloys available. Among the metals used for alloying are these highly wear-resistant elements—manganese . . . chromium . . . nickel . . . cobalt . . . tungsten . . . molybdenum. Each has particular resistance to certain types of wear—including impact, abrasion, heat, corrosion.

Your Amsco distributor has many helpful methods for selecting the proper hardfacing rod to most effectively combat types of wear you contact daily. *Make him your hardfacing headquarters.*

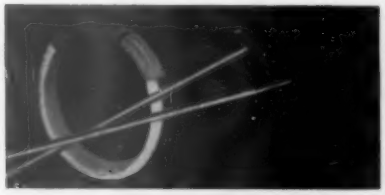
AMSCO CATALOG MAKES ROD SELECTION EASY

Write for the free catalog, *Amsco Hardfacing Alloys.* It presents complete analyses, metallurgical information and other pertinent data about Amsco's complete line . . . making it easy for you to look up the right rod to use in hundreds of common hardfacing applications. It is easy to understand and to apply the suggestions to your own operations. Send for it today.

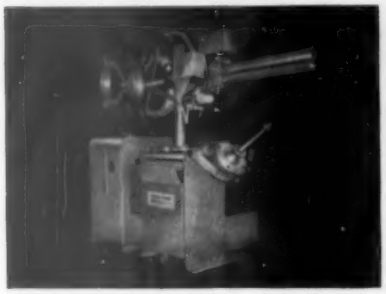
AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Ill.

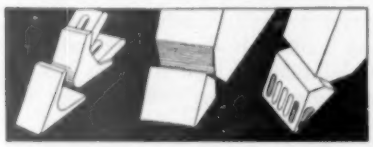
THE AMSCO® HARDFACING LINE IS COMPLETE . . .



Hardfacing Rods and Electrodes . . . A complete line of manual and automatic build-up and hardfacing materials. One for every repair job. Amsco rods and electrodes contain alloys of the toughest, hardest metals known including manganese steel.



Automatic Welders . . . The Amsco-Leader line of welders permits fully automatic build-up and hardfacing, especially in fields using heavy-duty equipment. Welding positioners and power unit included in package.



Amsco Repointers . . . Add the long wearing quality of manganese steel to digging equipment. All you do is weld them on. Available also are rounds, squares, flats, plate, grouser bars, electrodes—all made of manganese steel.

Free Booklets . . . Make it easy to select the proper Amsco hardfacing rods—or manganese steel shapes. Ask your distributor or write for these detailed booklets. Request No. 953 (hardfacing) and No. WA-77 (repointers, grouser bars, filler bars, plate).

Your Amsco Distributor can supply you with the entire Amsco line . . . make him your HARDFACING HEADQUARTERS.

AMERICAN MANGANESE STEEL DIVISION

AMERICAN Brake Shoe COMPANY

Chicago Hts., Illinois

Rectifier welder

REMOTE-control, 300-amp, d-c selenium-rectifier type arc welder has five-range control switch, providing coarse adjustment with generous overlap between ranges. Removable rheostat (for remote control) gives constant control by adjusting direct current through control coils.

Wide welding current range of 35 to 425 amp enables use of various electrode sizes. Welded core of electrical steel and no moving iron core or adjustable air gaps gives quiet operation. Sturdy lifting eye provides easy handling. Portable mounting is available. *Hobart Bros. Co.*

Circle No. 65.

* * *

Grinding machine

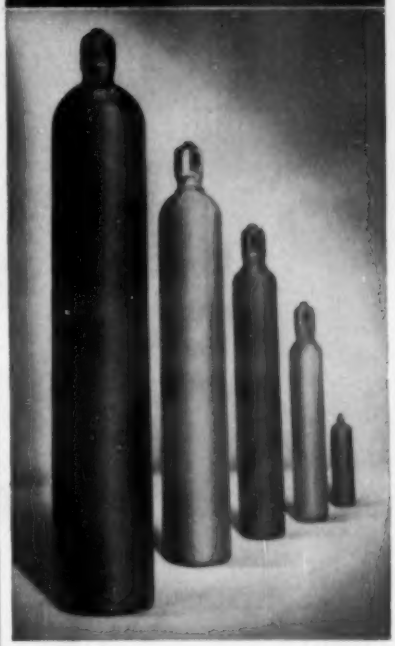
THIS is a small conveyorized all-purpose grinding, polishing and deburring machine. Designated "Model 304C," this bench-type abrasive-belt machine is said to handle all types of material. High production potential is claimed to be accompanied by low equipment cost.

Conveyor-belt drive motor has infinitely variable speed, 3-1 ratio and 1/3 hp, permitting flexibility for varieties of work. Drive motor for spring tensioned coated abrasive belt pulls 1½ hp and drives at 3,600 rpm. The 4-in. wide, 54-in. belt is easily changed and tracked. Hand wheel in front of machine adjusts grinding head and regulated grind pressure.

Multiple grind heads for rough- to finish-grinding are available. *Curtis Machine Corp.*

Circle No. 66.

Go to cylinder specialists for quality oxygen gas cylinders



It stands to reason: there is no substitute for experience. *Harrisburg Steel* is the pioneer and world's largest manufacturer of high-pressure gas cylinders made to I.C.C. specifications. And for decades, *Harrisburg Steel* has built reliable cylinders for all branches of the Welding industry . . . cylinders possessing extra margins of *quality* and *safety* . . . cylinders that perform better and last longer. Capacities range from 14 to 400 cubic feet . . . they are manufactured in both Domestic and Export types. The next time you order oxygen gas cylinders, may we suggest that you entrust your order to *Harrisburg Steel*. Meanwhile, write for catalog and current prices.

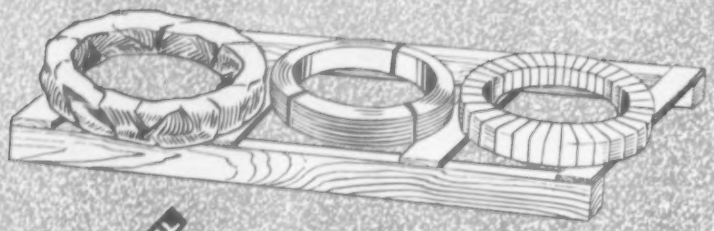
HSC-W-1/54

101 Years in Pennsylvania's Capital

Harrisburg Steel CORPORATION HARRISBURG 19 PENNSYLVANIA

PAGE...and only PAGE...

ACCO Quality

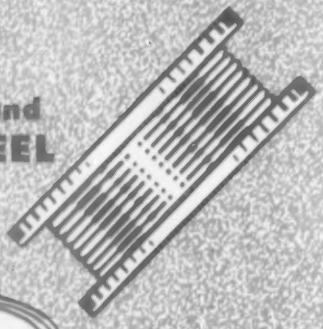


PALLETS

1000-lb., 2000-lb., 3000-lb. Wire coils are wrapped in waterproofed paper

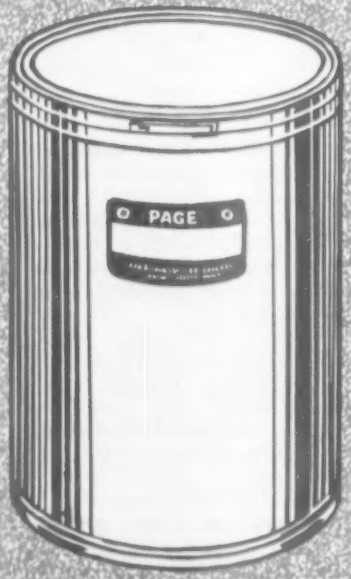
Layer Wound REEL

12" OD, 25-lb.



LEVERPAKS

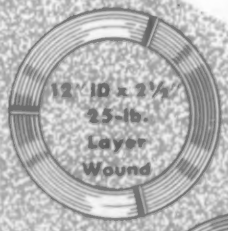
Perfect protection against coil distortion or wire corrosion. Reclosable.



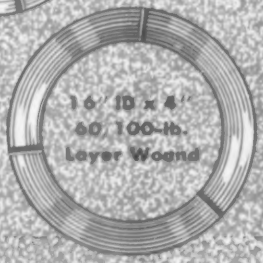
Choose the Package

PAGE Welding Wire is offered in a variety of convenient packages so you can choose the one best suited to your material handling system. PAGE Welding Rods and Electrodes are supplied in high-strength rectangular cartons and in lined, hermetically sealed, reclosable metal cans.

Be sure... Specify PAGE



COILS



. . . offers you—

- **Most popular welding wires**
- **A variety of convenient packages**

plus

- **Availability from local stocks**

CHOOSE THE WIRE YOU NEED FROM THIS COMPLETE LINE

Gas Welding Rods

Metal Specification — Page Designation

Armco Gas (GB-45)..Page Armco
Mild Steel (GA-50).....C Gas
Low Alloy (GA & GB-60).....
.....Hi-Tensile M
3½% Nickel (GB-65)..3½% Nickel
.55—.65 Carbon..Medium Carbon
.90—1.10 Carbon....High Carbon
Manganese Bronze.....
.....Manganese Bronze
Naval Bronze.....Naval Bronze
Stainless Steel.....
.....According to AWS analysis

Bare Electrodes

Armco.....Page Armco
Low Carbon.....Page "CE"
.13—.18 Carbon.....Page "B"
.55—.65 Carbon..Medium Carbon
.90—1.10 Carbon....High Carbon

Automatic Welding Wire

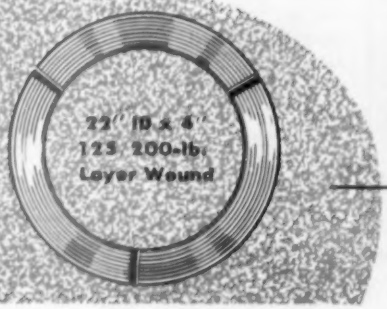
Armco.....Page Armco
.06 Maximum Carbon.....A-S-6
.10 Maximum Carbon.....A-S-10
.14 C., 1.75-2.10 MN.....A-S-15
.14 C., 1.90 MN., .50 MO.....
.....A-S-15-MO
.20 C., 1.20 MN.....A-S-20
Medium Carbon.....A-S-65
High Carbon.....A-S-110
AISI-4130.....A-S-4130
AISI-6150.....A-S-6150
SAE-9115.....NAX-9115
Silicon Killed.....Spec. #17
3½% Nickel.....3½% Nickel
Stainless Steel Automatic.....
.....According to AWS Analysis

Metal Spray Wire

Armco.....Page Armco
.10 Carbon.....#10
.28 Carbon.....#25
.40 Carbon.....#40
.60 Carbon.....#60
.80 Carbon.....#80
1.00 Carbon.....#100
3½% Nickel.....3½% Nickel
Manganese Bronze.....
.....Manganese Bronze
Naval Bronze.....Naval Bronze
Stainless Steel Metal Spray.....
.....According to AWS Analysis

PAGE DISTRIBUTORS all around the country carry stocks from which you can pick up your requirements—when you need them. This saves long lead time in ordering as well as a big investment in inventory.

Check with your nearby PAGE distributor today. See how he can save time...and money...for you. Or, if you prefer, write our Monessen, Pa., office for descriptive literature.



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Page Steel and Wire Division
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

for Better Value

ANNOUNCING... The most revolutionary achievement in ARC WELDING EQUIPMENT in years...

OBSOLETES ALL OTHER WELDERS OF COMPARABLE RATING!

Dimensions: only 11" x 12" x 7½"

BREN WELD MODEL 200 AW

FIRST TRULY PORTABLE 200 AMP. OUTPUT

ARC WELDER

Patent Pending

Weighs only 65 lbs... Carry it to the job!

Here's the BREN/WELD Portable Arc Welder on a maintenance job in the plant. It's equally "at home" anywhere – including production use.

A sensational transformer development permits the amazing BREN/WELD to do the work of conventional welders up to five times its size and weight! Handles electrodes from 3/64" to 5/32" and operates on 110/220 volts AC 50/60 cycles. Rated at 200 amps, it can actually deliver as high as 250 amps at reduced duty cycle. *Anyone* can make a professional weld with it. Has adjustable arc voltage for different arc characteristics.

Fully guaranteed, the BREN/WELD is rugged and highly efficient for use in almost every industrial plant, including automotive and aircraft—for both production and maintenance. Particularly desirable in construction work, automotive repair, on farms and in home workshops... Incomparable for shipyards and railroad shops.

Once you try this compact, power packed arc welder you'll wonder how you've gotten along without its convenience and wide range. See your dealer or write us direct for details of free trial offer!

LIST PRICE $169.50 F. O. B. LONG ISLAND CITY, N. Y.

24 HOUR DELIVERY FROM STOCK!

KASSON

Manufactured by BRENNEN, BUCCI & WEBER, INC. New York City

SALES DIVISION
KASSON DIE & MOTOR CORPORATION
Integrity Since 1919
32-14 NORTHERN BOULEVARD, LONG ISLAND CITY 1, N.Y.

Helmet attachment

SIMPLE method for economically attaching a welding helmet to a safety cap is said to be embodied in this "two clips and Neoprene strap" device. Installation of the "Speedy Attachment" in the field is done quickly with a screwdriver or a coin. The weldor then can instantly attach or detach the safety cap which is "clipped" into the helmet under tension of the strap. *The Fibre-Metal Products Co.*

Circle No. 67.

* * *

Spot welder

SPECIFICALLY designed for duty on heavier gages of mild steel, this new spot-welding machine nevertheless is suitable for welding light alloys. When used with the firm's "Tempomat" synchronous time equipment, the spot welder is claimed to achieve excellent results in welding stainless and nimonic steels.

The machine is fully automatic for both single and repeat operation. Welding speed on repeat is up to 100 spots per minute. Available with a choice of three throat depths—18, 24, and 30 in. *Phillips Electrical Ltd.*

Circle No. 68.

* * *

Welding compound

ANTI-spatter welding compound "Protect-O-Metal" is easy to use, manufacturer states. Non-inflammable and non-toxic, the compound is painted or sprayed on metal and wiped off after welding. Manufacturer claims one thinned coat is good for several passes. This compound also prevents annealing and oxidation scale, improves fusion, and quiets the arc. Three grades meeting all arc welding requirements are available. Cans have new labels. *G. W. Smith & Sons*

Circle No. 69.

For more information use card on page 101

Welding builds it faster, lighter and safer...

and RADIOGRAPHY checks each weld.

It swims. It climbs. It fights. It's tough and strong. For, from stem to stern, this L. V. T. is welded.

Welding saves precious weight and countless man-hours in construction. It avoids the rivets and bolts which become as lethal as shell fragments under shock.

With Radiography checking for soundness, welding continually finds new work to do—solves problems that would make jobs like this L. V. T. virtually impossible.

So weld shops, with small operations or large, are finding radiography valuable both for building reputations for good work and for expanding into new fields. If you would like to explore how Radiography can help you increase your business, get in touch with your x-ray dealer. He'll gladly talk it over.

RADIOGRAPHY

... another important example of photography at work

Kodak

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N.Y.

When the problem is silver brazing AIRCOSIL is your answer!

As a result of long research – and utilizing its many years of experience in all phases of metal working – Airco has developed a complete new line of silver brazing alloys, produced to Airco's own high quality standards. These are AIRCOSIL Silver Brazing Alloys and AIRCOSIL Silver Brazing Flux – two fine products "made for each other" to give you the best in silver brazing.

You'll find that the characteristics of AIRCOSIL alloys and flux are equal or superior to that of any competitive products. AIRCOSIL alloys and AIRCOSIL flux embody all the properties that assure consistently economical production and quality results.

Another innovation is that AIRCOSIL is available in avoirdupois weight – 16 ounces to the pound! Because industrial business everywhere is based on avoirdupois measures, this will save you complicated conversion time.

Airco, as a leader in the field of joining metals, has prepared a 24 page booklet which discusses AIRCOSIL in complete detail. If time and quality mean money to you, we advise that you contact your Authorized Airco Dealer or write Airco direct for your free copy.

AIRCO®

AIR REDUCTION

60 East 42nd Street • New York 17, N. Y.

Divisions of Air Reduction Company, Incorporated, with offices and dealers in most principal cities

Air Reduction Sales Company
Air Reduction Pacific Company

Represented internationally by Airco Company International

Foreign Subsidiaries:
Air Reduction Canada Limited,
Cuban Air Products Corporation

Products of the divisions of Air Reduction Company, Incorporated, include: AIRCO — industrial gases, welding and cutting equipment, and acetylenic chemicals • PURECO — carbon dioxide, liquid-solid ("DRY-ICE") • OHIO — medical gases and hospital equipment • NATIONAL CARBIDE — pipeline acetylene and calcium carbide • COLTON — polyvinyl acetates, alcohols and other synthetic resins.

AN AIR REDUCTION PRODUCT

AIRCO tips for silver brazing and heating

Bulbous flame, separable type tip is used with 10" Flexible Extension and permits forming tip and extension into any desired shape. Perfect for silver brazing inaccessible joints. Style 9 is largely used in refrigeration industry and air-conditioning units.

Three tube, three flame, bulbous tip. Style 736 is used where large amounts of heat are required for heating or brazing heavy copper sections.

Seven tube, multiflame tip assembly is adaptable for automatic brazing, light heating, and manual silver brazing. Style 737 tip with flexible tubes permits ingenious setups.

Two flame, dual tube, bulbous. Annealed tubing is used for these tips. Style 728 can be bent to any desired shape for heating, silver brazing and welding operations of light sections.

Write AIRCO for literature on these items

WELDING SHOW VISIT BOOTH 254

Weldor's glove

SPECIALLY designed glove of tanned leather has extended welted seams on fingertips for longer life, greater ease in grasping, and more wearing comfort. Glove features seamless palm, wing thumb, one-piece back with wool heat breaker. *Singer Glove Mfg. Co.*

Circle No. 70.

* * *

Blast cleaner

TABLE-type airless blasting machine, called a "72-in. Wheelabrator Swing Table," requires no pit at all for the abrasive hopper. The whole machine is built for floor level installation.

The machine has a 40-in. work height clearance and is meant to handle a wide range of work, like that found in job shops. Intended for cleaning castings, forgings, heat treated parts, weldments, or stampings, the table can hold either a few large pieces, or hundreds of small parts at one time.

The 72-in. diameter plain work table is mounted on the door of the machine. When the door is opened, the table comes out into the room for ease in loading and unloading. When the door is shut, the table automatically moves into the blasting zone of the machine and rotates the work under the abrasive blasts from a rotating, bladed wheel mounted in the cabinet roof. Centrifugal force alone propels the abrasive, with no compressed air needed. Blasting is automatic, and the operator never needs to enter the cabinet, manufacturer states. *American Wheelabrator & Equipment Corp.*

Circle No. 71.

TORIT

UNITIZED

DUST CONTROL

eliminates dust at its source!

TORIT UNITIZED

DUST CONTROL means each machine has its own custom-tailored dust collector designed to work specifically for *that* machine. There is no guess work, or average suction. Furthermore, dust control is provided only when that machine is running . . . there is no waste of power such as you have with centralized control when only a few machines are operating. This means better dust control at lesser operating cost and less initial installation cost. Get the facts now on how Torit will work better to . . . "CLEAR THE AIR".

See our catalog in Sweet's Machine Tool File, or write:

TORIT

MANUFACTURING CO.

270 WALNUT STREET

ST. PAUL 2, MINNESOTA

No single electrode is best

Job-match

A.O.Smith SW-11

A.O.Smith SW-12

A.O.Smith SW-17

SW-11

Here's a "cold" E-6012. Designed for all position welding with minimum penetration, maximum throat thickness. Performance is exceptional when fit-up is poor . . . bridges over, won't burn through. Operates much better on A.C. than ordinary E-6012 electrodes. Widely used for truck bodies, farm machinery, foundry equipment, storage tanks, etc.

for every job in AWS Class E-6012

your electrodes with A. O. Smith's BIG THREE

BECAUSE welding is A. O. Smith's *full-time* business — because we constantly use every type of welding electrode right in our own shops — we know this for a fact:

You can't handle every job in AWS Class E-6012 with just one electrode. There's no one-shot cure-all!

That's why we give you the BIG THREE — three fine electrodes, each tailored to deliver top performance on different Class E-6012 jobs.

A. O. Smith's BIG THREE lets you job-match your electrodes . . . helps you pick the one that's exactly right for your particular operation.

Check the details in this ad. Then, see your A. O. Smith distributor . . . or write direct. A. O. Smith Corporation, Welding Products Division, Milwaukee 1, Wisconsin.

SW-12 This is a "hot" E-6012 . . . versatile, smooth and fast. Designed for applications where the upper end of the amperage range is employed. Weld deposition is much faster than with SW-11. Welder can hold a close arc without sticking. SW-12 also works well where fit-up is poor . . . bridges across, assures a good weld and won't penetrate through.

SW-17 A "hot" E-6012, can take from 30-40 more amperes than others. A general purpose high rutile type electrode for heavy production welding, where fit-up is poor and high ductility and mechanical properties are desired. Built-in toughness is one outstanding characteristic. Deposition is extremely fast, physicals are excellent. It is highly recommended for horizontal single pass fillet work.

Produced by welders for welders

Because welding is our full-time business, we offer you the top line of welder-proved equipment and accessories. Everything from a-c and d-c welding machines to helmets and cleaning tools.

Through research ...*a better way*

A.O.Smith

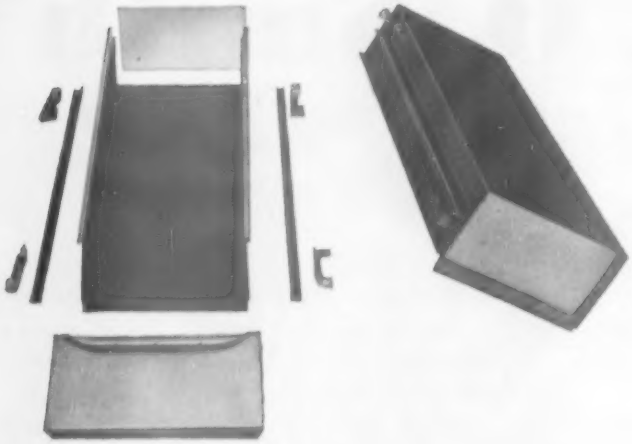
CORPORATION

WELDING PRODUCTS DIVISION
Milwaukee 1, Wisconsin
INTERNATIONAL DIVISION: MILWAUKEE 1, WISCONSIN

HOW Federal® Helps GF

BUILD BETTER METAL OFFICE FURNITURE

SPECIAL WELDER COMPLETES 300
9-PIECE DRAWER ASSEMBLIES PER HOUR



Desk drawer units in the new General Fireproofing Generalaire* line of metal office furniture are assembled and welded on special automatic resistance welder designed and built by Federal.

Nine separate parts are spot and projection welded in this machine to produce a complete drawer assembly. Dual shuttle fixtures are employed permitting maximum utilization of the welder. While one fixture is being loaded and reloaded at one end of the machine, the fixture on the opposite end is in the welding station. With an operator at each fixture loading station, a total hourly production of 300 drawer assemblies can be obtained.

Built-in rapid adjustment that will accommodate four different drawer sizes and "swing out" gun mounts for easy maintenance are two of the many features designed into this machine. It's another reason why Federal Stays — First in Resistance Welding.

For further details write for special bulletin TD-22 or contact the Federal representative nearest you.

*TM General Fireproofing

Federal® WELDERS
Warco PRESSES®

The Federal Machine and Welder Company
WARREN, OHIO

Resistance welders

NEWLY designed three-phase spot and projection welders are available in 50, 75, 100 and 150 kva at 50% duty cycle. The "SPT2" can be supplied from 18 to 48-in. throat depth, with an electrode force of 2,260 to 4,000 lb (80 psi) dependent on throat depth. The "EPT2" can be supplied from 12 to 30 in. throat depth, with an electrode force of 3,000 to 5,000 lb. Both series are standard, air-operated, press-type machines. *Sciaky Bros., Inc.*

Circle No. 72.

* * *

Helmet sweat pad

THIS sweat pad has lamb's wool approximately ¼ in. long and is fastened to the headgear by four snap fasteners. It can be used not only for welding helmets but also for scarfing masks, face shields and wherever the conventional headgear is used. Available in two widths: ⅞ and 1¼ in. *Sellstrom Mfg. Co.*

Circle No. 73.

* * *

Welder

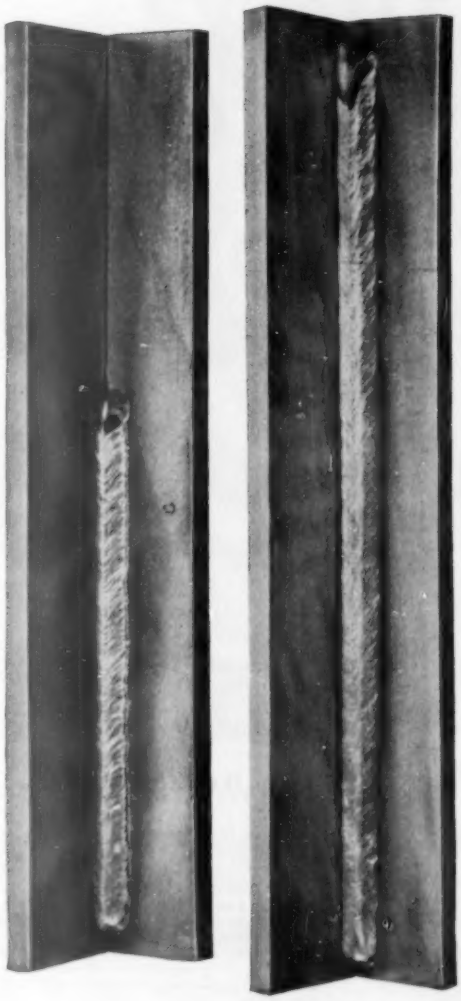
DESIGNED for small parts welding, this automatic machine can feed weld, form and cut-off 0.001 wire to precision specifications. The welder is especially suitable for welding whisker wires on diodes. Wire is fed directly from reel and welded to top or side of pin. Machine comes complete with capacitor discharge power supply. *Tweezer-Weld (Federal Tool Engineering Co.)*

Circle No. 74.

For more information use card on page 101

WELD WITH WESTINGHOUSE

Up to 60% greater deposit rates with Westinghouse ZIP-27*



Fillet made with ordinary rod.

Fillet made with ZIP-27.

Because:

FACT 1: Westinghouse ZIP-27 electrodes give 50% more fillet weld feet per electrode. Slag easily removed. High speeds possible in skip and tack welding; also, ideal for "drag technique."

FACT 2: Westinghouse ZIP-27 strikes instantly. X-ray quality welds with ductility of 25-30% are obtained. Even inexperienced operators can make smooth, high-quality, balanced fillets with minimum spatter.

PROVE IT TO YOURSELF!

Write us on your company letterhead. Ask for free samples ZIP-27 rod. Ask for free booklet, *Westinghouse ZIP-27 Electrodes.* Your copy will be sent by return mail. Or send coupon below. J-21866

* Powdered iron-coated electrode

YOU CAN BE SURE...IF IT'S

Westinghouse

Westinghouse Electric Corporation
Welding Division Buffalo, N. Y.

- ☐ Send FREE ZIP-27 booklet
- ☐ Send FREE ZIP-27 rod samples
- ☐ Have welding specialist call

Name _____ Title _____

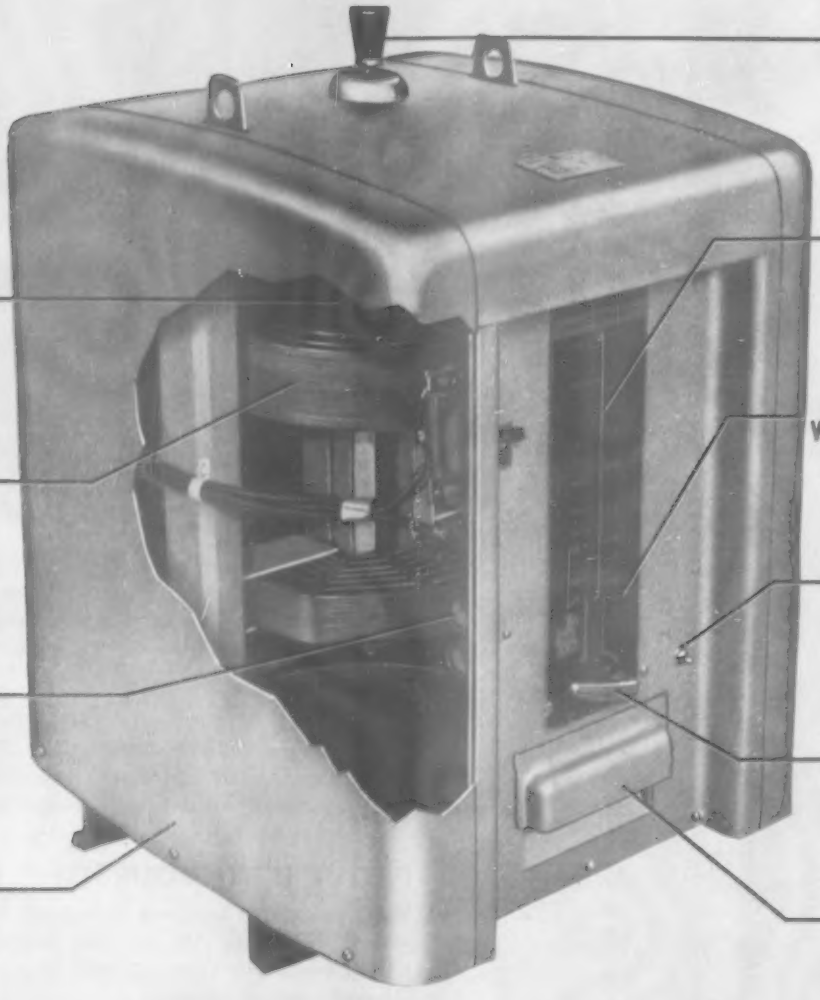
Company _____

Street & No. _____

City _____ Zone _____ State _____

WE-3-55

WELDING ARCS NEWS



*Improved Arc-performance Features, Available Optionally

Check the G-E welding distributor near you . . .

Alabama: Birmingham—Alabama Oxygen, Young & Vann Supply; Mobile—Turner Supply

Arizona: Phoenix—Consolidated Welding Supply

California: Fresno, Los Angeles, Oakland, Sacramento, San Diego, San Francisco, Ventura—Victor Equipment

Colorado: Boulder, Colorado Springs, Denver, Durango, Ft. Collins, Ft. Morgan, Greeley, LaJunta, Longmont, Pueblo, Sterling—Hendrie & Bolthoff

Connecticut: Hartford, New Haven—Harris Company

Florida: Hollywood—Florida Gas & Chemical

Georgia: Athens—Welding Gas Products; Atlanta, Macon—Welding Supply & Service; Augusta—Marks Oxygen; Columbus—Williams Welding Supplies; Gainesville—Welding Gas Products

Idaho: Boise—Gate City Steel

Illinois: Chicago, Moline, Rockford—Machinery & Welder

Indiana: Evansville—Drillmaster Supply; Ft. Wayne, Indianapolis—Sutton-Garten, South Bend—Perry Welding Sales & Service

Iowa: Des Moines—Machinery & Welder

Kansas: Wichita—Standard Products

Kentucky: Louisville—Reliable Welding; Paducah—Henry A. Petter Supply

Louisiana: Alexandria, Shreveport—Hughes Oxygen; New Orleans—Industrial Air Products of the South

Maine: South Portland—Portland Welding Supply

Maryland: Baltimore—Arcway Equipment

Massachusetts: Boston—New England G-E Welding Sales Division

Michigan: Detroit, Saginaw—Welding Sales & Engineering; Grand Rapids—Miller Welding Supply

Minnesota: Duluth—W.P.&R.S. Mars; St. Paul—Production Materials

Mississippi: Greenwood—Delta Oxygen Co.; Jackson—Jackson Welding & Supply

Missouri: Kansas City—Hohenschild Welders Supply; St. Louis—Machinery & Welder

Montana: Billings—Valley Welders Supply; Billings, Bozeman, Cut Bank, Glasgow, Great Falls, Havre, Kalispell, Miles City, Shelby, Sidney, Whitefish—Valley Motor Supply; Butte, Great Falls—Montana Hardware

Nebraska: Lincoln—Lincoln Welding & Supply; Omaha—Baum Iron

New Hampshire: Manchester, Nashua—MacLeod Co.

New Jersey: Elizabeth—Interstate Welding Supply

New Mexico: Albuquerque—Industrial Supply Co.; Hobbs—Western Oxygen; Las Cruces, Silver City—Car Parts Depot, Inc.

NEW G-E 295-amp a-c welder provides big-welder advantages at a small-welder price—only $237**

General Electric's new *295-amp* a-c welder brings you a versatile intermediate rating for: repair work and light production in job shops; industrial maintenance; tack welding and many other general-purpose jobs. It offers many benefits you would ordinarily expect only from a heavy-duty unit:

75 OPEN-CIRCUIT VOLTS—means quick starts, arc stability, and use even with "tough" electrodes like stainless-steel and low-hydrogen.

MOVING-COIL DESIGN—provides pinpoint accuracy in current settings and resettings. Settings can be made in an infinite number of steps over a wide current range.

SPECIAL RUBBER COIL MOUNTING—reduces friction, wear; makes turning of current lever almost effortless.

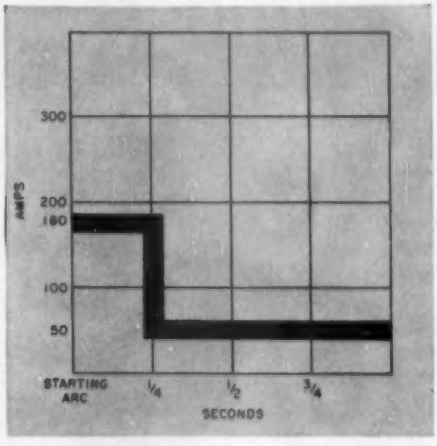
UNIVERSAL BOLT-TYPE TERMINALS located at the base to eliminate nuisance and hazards of dangling leads.

CONVENIENT RANGE SWITCH permits quick moves from high to low settings without unplugging leads.

For details, ask your G-E welding distributor for bulletin GEC-1305. General Electric Co., Schenectady, N. Y.

712-1

EACH SIDE COVER LIFTS OFF easily, with removal of only 3 screws. And no parts are attached. Simple inside construction can be serviced quickly.



AUTOMATIC HOT-START provides an extra surge of current when electrode touches the work. Arc striking is instant; sticking is reduced. Result: welding speed is increased and weld quality improved.

WIDE CURRENT RANGE spans 25 to 295 amps. Permits wide application. The low end of the range is expanded for fine accuracy.

***Mfrs. suggested resale price. Slight additional charge for freight west of Mississippi and Florida.*

GENERAL ELECTRIC

his convenient location means fast service

New York: Buffalo—Welding Equipment Sales; New York City—Weld-Arc Sales and Supplies, Syracuse—Welding Engineering & Equipment

North Carolina: Charlotte—Dixie Gases; Gastonia—Gastonia Motor Parts

North Dakota: Bismarck, Fargo—Acme Welding Supply

Ohio: Akron, Cincinnati, Cleveland, Columbus, Dayton, Mansfield—Burdett Oxygen; Toledo—Odland Iron Works; Youngstown—Arcway Equipment Co.

Oklahoma: Oklahoma City—Hooper Supply; Tulsa—G-E Welding Sales Division

Oregon: Eugene, Portland—J. E. Haseltine; Medford, Portland—Industrial Air Products

Pennsylvania: Allentown, Philadelphia, Pittsburgh, York—Arcway Equipment

South Carolina: Columbia, Greenville—Welding Gas Products

South Dakota: Deadwood—Hendrie & Bolthoff; Lemmon—Valley Motor Supply Co.

Tennessee: Chattanooga, Knoxville, Nashville—Welding Gas Products; Memphis—Delta Oxygen

Texas: Abilene—M&M Welding Supply; Alice, Corpus Christi—Crane Welding Supply; Alpine, El Paso, Marfa, Pecos—Car Parts Depot; Amarillo—Welding Equipment & Supply; Beaumont—Beaumont Oxygen; Brownsville, Harlingen—Acetylene Oxygen; Dallas—Hill Equipment & Supply; Houston—G-E Welding Sales Division; Lubbock—Welders Supply of Lubbock; Midland—West Texas Welders Supply; Odessa, Pecos—Western Oxygen; Orange—Marine & Petroleum Supply; Pecos—Welding Supply Co.; Plainview—Plains Welding Supply; San Angelo—Southwestern Welding Supply; Texarkana—Hughes Oxygen; Wichita Falls—McGinnis Welding Supply

Utah: Salt Lake City—The Gallgher Co.

Washington: Seattle, Spokane—J. E. Haseltine; Seattle, Spokane, Yakima—Industrial Air Products

West Virginia: Bluefield—Bluefield Supply; Charleston—Virginian Electric; Huntington, Logan—Logan Hardware & Supply

Wisconsin: Milwaukee—Machinery & Welder

Wyoming: Cody, Lovell—Valley Motor Supply Co.

Alaska: Anchorage—Northern Supply

Canada: Toronto—Canadian G.E.

Guam: Agana—Industrial Air Products Div. of Island Equipment Co.

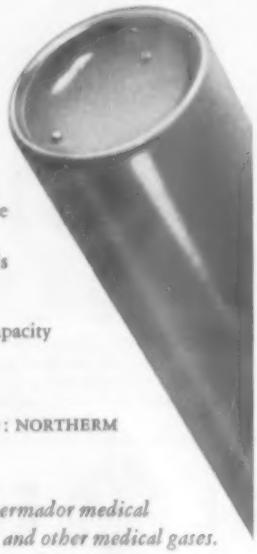
Hawaii: Honolulu—American Factors, Ltd.

saves you money
Norris-Thermador deep-drawn cylinders are curled under to form a heavy-duty built-in rolling surface that is even, strong, and permanent. *You save* because there is no rolling ring to lose or dent. Cylinders stand together evenly in transit. Further economies: cylinders are up to 10% *lighter* and fill faster than other monolithic filler type cylinders. And with Norris-Thermador's vast plant in the deep-water Port of Los Angeles, *you save* on overland freight.

NORRIS-THERMADOR

acetylene cylinders

precision-made
An exclusive and extremely accurate cold-draw process keeps shell weight to a constant thickness — with maximum thickness and strength in the cylinder shoulders. Excess weight is eliminated. *In addition, all welding is X-ray controlled.* Norris-Thermador cylinders meet or exceed ICC specification 8. (Cylinders are also made to Canadian Board of Transport Specifications. A disinterested inspection agency is available as required for these cylinders.)



Acetylene Cylinders from 10 to 300 cubic foot capacity

early shipment
Write or wire for specifications on all sizes. Cable : NORTHERM

Ask about precision-made Norris-Thermador medical cylinders for oxygen, nitrous oxide and other medical gases.

NORRIS-THERMADOR CORPORATION
5215 South Boyle Avenue, Los Angeles 58, California

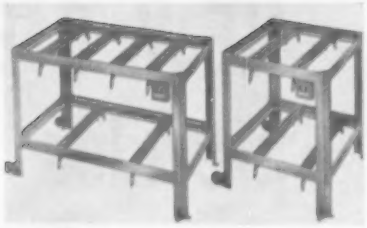
Please send me illustrated cylinder specification sheets.

Name_____

Address_____

City_____ Zone____ State_____

WE-355 3-954



Welding stand

VERSATILE stand saves time when used as base for welding or assembly fixtures. Support beam, rubber-shock mounted to absorb vibration, carries heavy loading and can be cam-locked anywhere on upper or lower frame. Vibration-free bolting locks stand together. Feet adjust for level surface and wheels can be attached. Attachment is available for remote control switching and a power outlet is provided for a work light. Stand has two sizes (26 by 26 in. and 26 by 44 in.) and two heights (25 in. and 32 in.). *Sturdi-Bilt Steel Products, Inc.*
Circle No. 75.

* * *

Mig welding wire

"MICROSTEEL" is the name of "Microspooled" carbon-steel welding wire for use with Mig (metal inert-gas) welding processes. This electrode wire is said to be microfinished and precision spooled to effect flawless welding of mild steel. *Weldrod Co.*
Circle No. 76.

* * *

Isotron

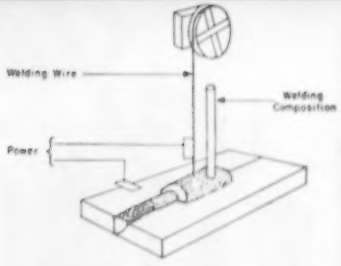
"IRIDIUM Isotron" is used for remote handling of iridium 192 in industrial radiography. Sources up to 75 curies can be exposed at distances up to 50 ft. from operator. The isotron was specifically designed for shots inconveniently handled by X-ray equipment. The construction of the isotron and the method for changing sources is said to eliminate maintenance in this equipment. The machine is portable, weighs only 125 lb and requires no power. Exposure times comparable with those for X-ray are obtainable, it is claimed. *The Gamma Corp.*
Circle No. 77.

* * *

Temperature indicator

"TEMPIL" pellets, liquid temperature indicators, are now available in 425 and 475 F. Pellets can be had in 12½-deg steps from 113 to 400 F, in 25-deg intervals from 400 to 550 F, and in 50-deg steps from 550 to 2,500 F. *Tempil Corp.*
Circle No. 78.

UNIONMELT Welding Solves "Impossible" Casting Job . . .



UNIONMELT welding solved the problem when a manufacturer was unable to make one-piece castings of compressor cylinders used in gas line pumping stations—other welding methods proved too slow and costly . . . UNIONMELT welding cuts 40 hours in production time, and produces high-quality welds that easily withstand pressure of 750 lb. per sq. inch.

The 42-in. diameter cylinder is cast in two halves, and has an internal piston bore with surrounding suction and exhaust chambers . . . The 2½-in. thick piston walls and 3-in. thick outer walls of each half are aligned and UNIONMELT welded.

Like many other products throughout industry, these cylinders are being fabricated faster and more economically than ever before, because UNIONMELT welding offers:

- Higher welding currents than other welding processes . . . Up to 4,000 amperes . . . Joins metal of any thickness.
- Greater economy—½ to ¾ less welding wire . . . Also uses larger-diameter, less-expensive wire.
- Use of any power supply—a.c., d.c., or constant potential . . . With c.p., no control is necessary to maintain constant arc voltage—welding is fast and more easily controlled.

Start saving now—call your local LINDE representative for more information and ask for Form 7942, "Modern Methods of Joining Metals."

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY
Division of Union Carbide Canada Limited, Toronto

The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

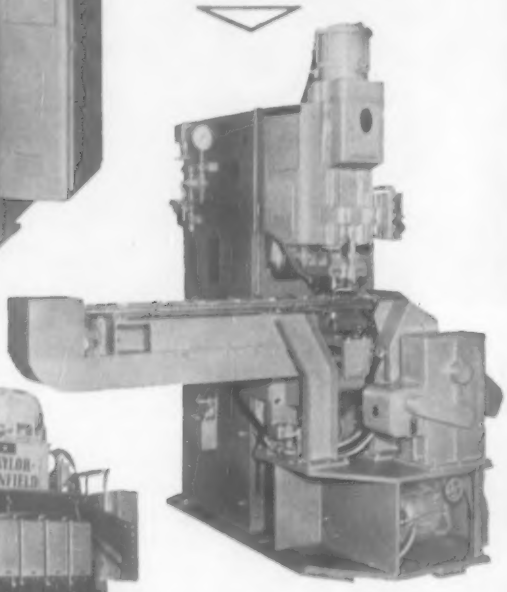
Linde Trade-Mark

A STANDARD T-W RESISTANCE WELDER

Versatile uses; prompt delivery; lowest price.

OR A STANDARD WELDER MODIFIED

Special tooling; mechanized loading and unloading; increased production; low cost re-tooling.



OR A SPECIAL WELDER DESIGNED FOR YOUR WORK

Volume production at lowest unit cost.

Resistance Welders Since 1898

Sales and Service

CHARLOTTE • CHATTANOOGA
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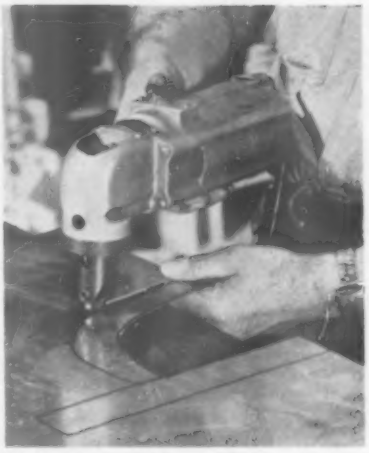
ST. LOUIS • STAMFORD • WASHINGTON
OAKVILLE AND WINDSOR, ONTARIO

TAYLOR-WINFIELD
RESISTANCE WELDERS

THE TAYLOR-WINFIELD CORPORATION WARREN, OHIO



Metal-cutting tool

FACILITY in cutting stainless steel up to 18 gage, milder steels and other sheet stock up to 16 gage, is aim of cutting tool "Nibbler," according to the manufacturer. It is also handy for cutting unusual shapes. Using a punch and die action, the "Nibbler" removes a tiny slug of metal with each cutting stroke, making all cuts clean and minimizing scratches, scuffs, flaking and chipping. Fenway Machine Co.

Circle No. 79.

* * *

Hardfacing electrode

IMPROVED hardfacing electrode provides a tough, longer-wearing buildup for worn parts, claims this manufacturer. Also, new alloy balance is said to permit a smoother flowing deposit when rebuilding. Designed primarily for oil-field hardfacing applications, the "No. 7" electrode is especially suited for rebuilding equipment requiring high resistance to heavy impact, severe abrasion and shock.

Application is by electric arc only. Rockwell C is 54 to 57 with high red hardness. Available in two sizes only —3/16 and ¼ in. *Mir-O-Col-Alloy Co., Inc.*

Circle No. 80.

* * *

Arc-melting furnace

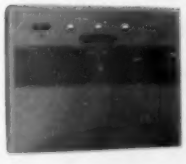
MULTIPURPOSE inert-atmosphere, arc-melting furnace can handle such ordinary metals as copper and iron or material previously considered too refractory for commercial production—chromium, tantalum, tungsten, titanium, zirconium. The furnace makes use of direct current and a non-consumable electrode. *General Electric Co.*

Circle No. 81.

Hardened areas show darker at ends of rocker arm.

for accurate selective hardening of this rocker arm

...using a Lindberg 50 KW High Frequency Unit



Visit Lindberg at ASTE Show, Booth 666, and at ASM Western Metal Exposition, Booth 334

In Detroit, a leading manufacturer of prestige autos increased production of rocker arms 300% by switching to a Lindberg 50 kw high frequency unit with a new work fixture. Production is now 1550 per hour . . . with no rejects due to unit failure.

Selective hardening of these pearlitic malleable iron rocker arms provides wear resistance from valves and push rods. A sharp cutoff of the hardness is necessary because the center hole must be kept soft for further machining.

Lindberg high frequency units give continuous 24 hour a day operation with a maximum of dependability. If you have an induction heating application, you'd do well to talk things over with a Lindberg engineer.

LINDBERG **HIGH FREQUENCY DIVISION**

Lindberg Engineering Company • 2477 West Hubbard Street • Chicago 12, Illinois

UNITED'S PHOSON BRAZED JOINTS

for **Pressure Piping**

Mean Continual

Trouble-free Operation at

Manhattan House

New York Life Insurance Co.'s Modern 20-Story Apartment in New York City

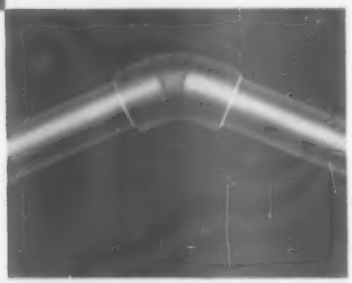
Here is proof positive of PHOSON'S dependable, low-cost efficiency!

Engineering specifications for Manhattan House specified all joints be brazed between copper tubing and threadless wrought copper fittings and cast bronze valves for the forced hot water heating system to be operated at 115 PSI at a temperature of 240°.

Brazed joints were specified to assure strong non-corrosive permanently safe construction . . . and PHOSON was specified because it had the highly dependable physical properties so necessary and the joints could be brazed rapidly and at low cost!

PROVE PHOSON IS BEST FOR YOUR JOB — LARGE OR SMALL!

Contact your UNITED Welding Supply Distributor



Typical Manhattan House Brazed Joint

UNITED WIRE

AND SUPPLY CORP.

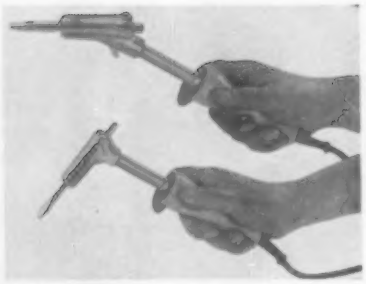
Brazing Alloy Division

PROVIDENCE 7, R. I. • OFFICES IN PRINCIPAL CITIES

Ask to see the new United Wire color film "When Metals are Brazed". Write for showing dates and literature.

Permanently United

SEND FOR SPECIAL PHOSON FOLDER NOW!



Soldering tool

"ZEVA" electric soldering tool is available in 16 styles covering range of 30 to 800 watts. Built-in heating element, hermetically sealed in cast aluminum, is said to last as long as tool. Inner surface of element housing is heat-proof and non-corrodible. Copper tip is instantly adjustable by eccentric lever. *Paul C. Roche Co., Inc.*

Circle No. 82.

• • •

Stud welding

TIMING is carried out by means of a cartridge placed at end of stud in new method of stud welding. This does away with additional equipment usually necessary in conventional stud-welding practice, according to manufacturer. Special studs are not needed with the new process—normal ones, treated or not, including black studs, may be employed.

Welding gun is also of simple design. It contains only a spring for pressing stud holder against the weld piece. It can be operated on a-c mains and can be used with standard welding transformers. *Phillips Electrical Ltd.*

Circle No. 83.

• • •

Soldering oven

RADIANT oven for continuous production soldering utilizes the high intensity radiation of "color-blind" far-infrared electric radiant heaters. A stainless steel conveyor belt with five speeds available passes work through the oven. The work passes under the radiant heaters and comes out soldered.

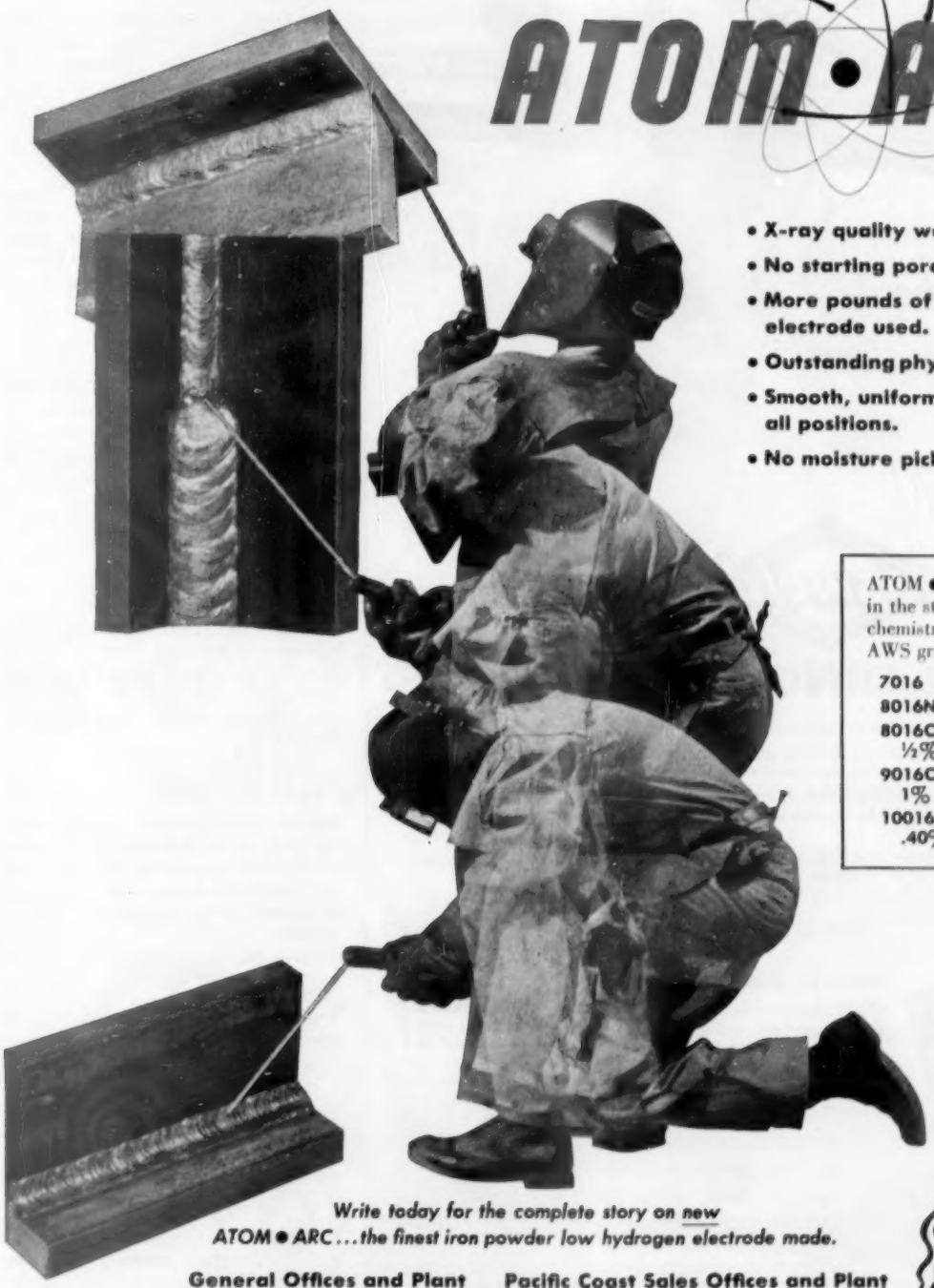
In addition to variable conveyor speeds, elevation of the heaters is easily changed to vary the distance from the work. Operating heat can be maintained through short non-working periods by the use of one heater. *Electrical Industries.*

Circle No. 84.

For more information use card on page 101

the only all position iron powder low hydrogen electrode...

ATOM • ARC



- X-ray quality weld metal.
- No starting porosity.
- More pounds of weld metal per electrode used.
- Outstanding physical properties.
- Smooth, uniform weld bead in all positions.
- No moisture pick up.

ATOM • ARC is available in the strength levels and chemistry of the following AWS grades:

7016
8016N (3½% Ni.)
8016CM (1¼% Cr., ½% Mo.)
9016CM (2¼% Cr., 1% Mo.)
10016MM (1.70% Mn., .40% Mo.)

Write today for the complete story on new ATOM • ARC...the finest iron powder low hydrogen electrode made.

Alloy Rods Co.

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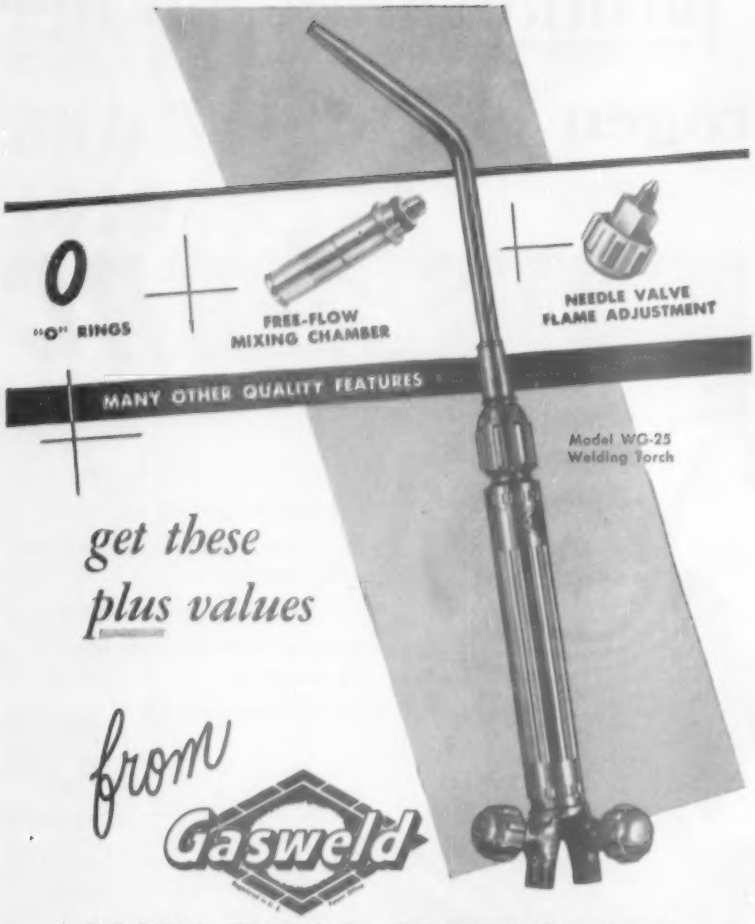


get these plus values

from Gasweld

WELDING TORCHES

An outstanding all-round performer.

New "O" Ring Assembly permits fast change from welding to cutting attachment. Hand tightening alone gives perfect, gas-tight seal.

Gasweld Needle Valve Adjustment eliminates possibility of flame fluctuation—even when torch is bumped or jarred. *Famous Free-Flow Mixing Chamber* minimizes flashback.

Solid seamless ribbed brass handles, precision-balance and rugged, long-life construction are other quality features that make Gasweld your best torch buy.

See the Model WG-25 and the complete line of Gasweld torches at your dealer's. Or write for full information.

FREE CATALOGS

LIQUID manufactures a complete line of both Gas and Arc welding equipment and supplies. Send for your Gasweld and Arc Welding catalogs today.

VISIT US AT BOOTH 125
WELDING SHOW
MUNICIPAL AUD.
Kansas City, June 8-10

Liquid

LIQUID also produces Oxygen, Acetylene and other commercial gases including CO_2 in all its forms—Gas, Liquid and Solid (dry ice) for industrial use.

THE LIQUID CARBONIC CORPORATION
Industrial Gas Division
3100 South Kedzie Ave., Chicago 23, Illinois

NEW PRODUCT BRIEFS

Improved "Mineralight" (black light) unit is designed for use in difficult inspection procedures and in flaw detection as well as other operations. *Ultra-Violet Products, Inc.*

Circle No. 85.

* * *

Air filters are for removal of water, dirt and pipe scale from compressed air lines, thus give protection to air-operated instruments, tools, cylinders, etc. *Generant Engineering Co.*

Circle No. 86.

* * *

Impact wrench, called "Speed-Wrench No. 55," may be adapted for driving square end taps, round shank drills, reamers, wire brushes and other accessories. *Thor Power Tool Co.*

Circle No. 87.

* * *

Two new polishing oils, called "Excelene NF" for nonferrous metals, when applied to abrasive belts, are said to reduce loading, give them longer life and aid in faster grinding and improved finishes. *D. A. Stuart Oil Co., Ltd. and Minnesota Mining & Mfg. Co.*

Circle No. 88.

* * *

Design improvements in the "880" series of hand and foot valves are now incorporated in the operating mechanisms of both the three-way and four-way models. *Ross Operating Valve Co.*

Circle No. 89.

* * *

Alpha - beta - gamma survey meter "SU-14" is a lightweight, portable, waterproof instrument for use both as a radiation dosage rate meter and as a monitoring instrument. *Tracerlab Inc.*

Circle No. 90.

* * *

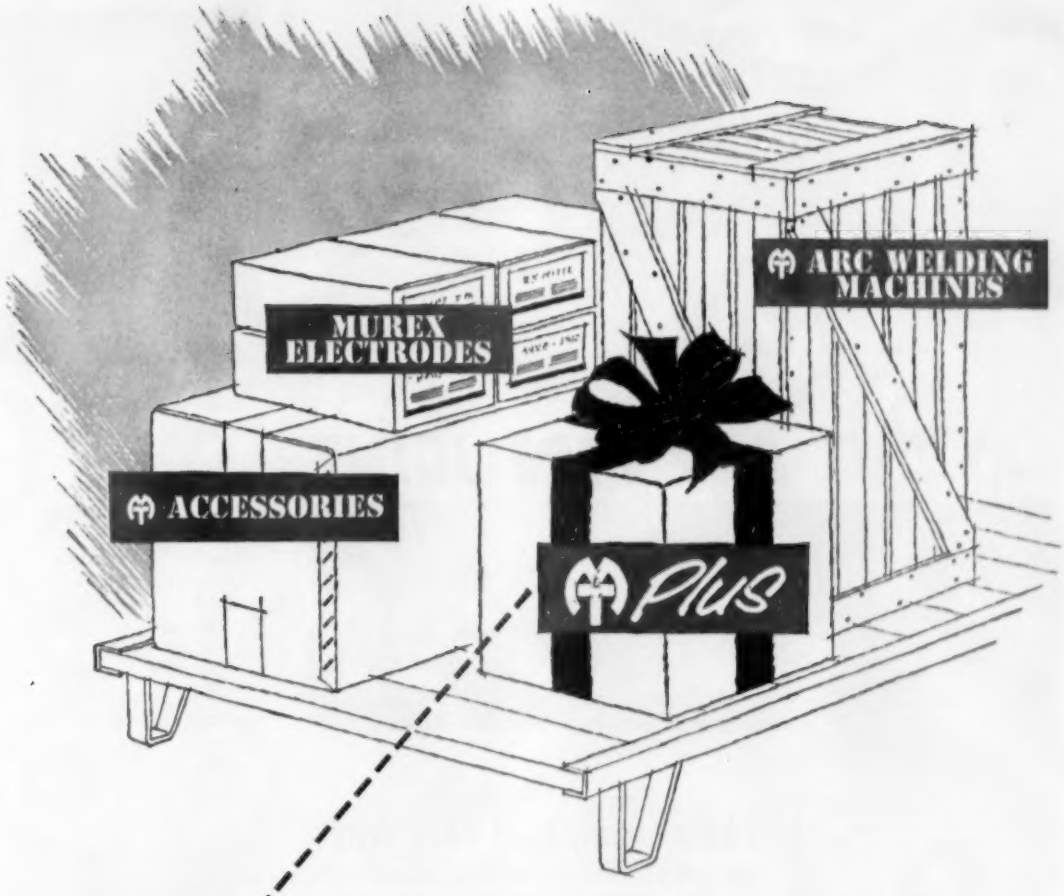
Full-strength grip is assured by a 10-threads-per-inch "Acme" screw from zero closing to the full opening of 7 in. (9 in. when used as a *C* clamp) in new low-cost vise for home, garage or shop. *Amercian Machine & Foundry Co.*

Circle No. 91.

* * *

Lifting magnet weighs only 3,400 lb and is designed especially for use with mobile or overhead gantry cranes. *The Ohio Electric Mfg. Co.*

Circle No. 92.



YOU GET *INTANGIBLES*, TOO — at M & T

EXPERIENCE — *Your M & T representative is a seasoned, practical welding engineer*

CARE — *eager and able to meet your welding needs and consult on your welding problems*

SERVICE — *promptly and efficiently.*

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ARC WELDING — Materials and Equipment
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STABILIZERS for Plastics
TIN, ANTIMONY and ZIRCONIUM CHEMICALS

NEWS . . . . . *from page 6*

merly included the responsibilities now allocated to the Electro Minerals Division, will be designated "The Bonded Abrasives Division". It will specialize in manufacture and sale of grinding wheels, sharpening stones and other bonded abrasives which include over 30,000 standard products each year.

Other officers appointed were George R. Rayner, Jr., sales manager, and D. George Vanderhoek, manufacturing manager. Joseph J. Forrester will be manager of product engineering; Harold L. Schmidt will be works manager of the Niagara Falls plants of the new division, and Elmer E. Howard, manager of the Vancouver plant.

Facilities and personnel included in the new division are the silicon carbide furnace plant, fused alumina furnace plant, abrasive grain and powder processing facilities, and the storage and auxiliary equipment at Niagara Falls, the silicon carbide furnace and crushing plant in Vancouver, Wash., together with the company's employees at these installations.

—Nelson Stud Welding Photo

Stud welding improves baling machines

Extensive use of stud-welding equipment in fabrication of American Baler Co.'s new vertical waste balers is said to have contributed improved appearance and substantially reduced machining and assembly costs. The threaded studs being installed in the operation pictured above are used to fasten wooden boards to the machine base, a method which is also followed in fabricating and assembling the platen. One man can handle this assembly work.

Granular flux-filled studs are also used in attaching structural members, guides and other components to the side panels, resulting in a minimum of exposed fasteners. American Baler is located in Bellevue, Ohio.

* * *

Welded aluminum sleds pass rigid Arctic test

BUILT entirely from welded and riveted aluminum alloy, a new type of sled was tested under actual working conditions by a British expedition, which returned to England two months ago after a three-month visit to the Arctic.

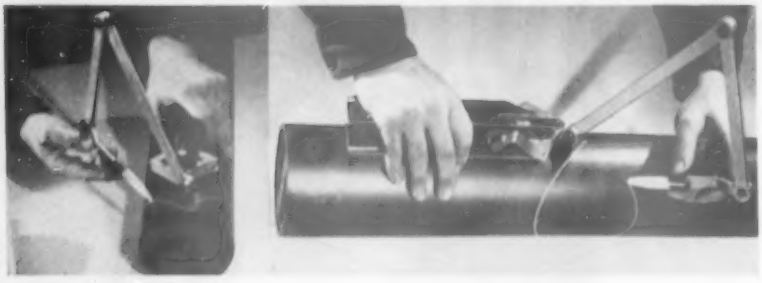
Three sleds were built—one 12 ft long and two 8 ft long. Both edge stiffeners and hooks were welded to the main shells; the runners were riveted. All three sleds were 2 ft wide and 8 in. deep. The "boat" shape of the sleds enabled the party to melt snow in them, thus making it easier to obtain quantities of water.

* * *

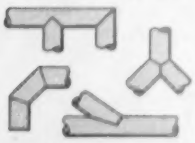
Computing service has applied-math group

Mathematical Computing Service, Brooklyn, N. Y., which performs services for industries desiring engineering calculations in metallurgical engineering, has established a new group devoted exclusively to applied mathematics.

LAY OUT ANY PIPE JOINT



LAY OUT ANY PIPE JOINT, SHOWN BELOW, on any size pipe from 1½" to 48"



Mark Structurals
Adapter for marking structural angles included with either model of the Contour Marker.

The proven, fast easy way

IN LESS THAN 5 MINUTES you can lay out a Y, a T, an L or any angle joint with a Contour Marker. IT'S EASY and absolutely accurate; it is calibrated in both degrees and pitch. Just set the angle and with a smooth swing of the Contour Marker's soapstone point you are ready to cut! You save "man hours" as well as oxygen and acetylene gas because "cut and try" methods are eliminated.

Two Sizes: Standard, for pipes 1½" to 18" dia.; Jumbo, for pipes 16" to 48". Instruction book included. Belt case available. Write for information.

Sold by welding supply dealers everywhere.

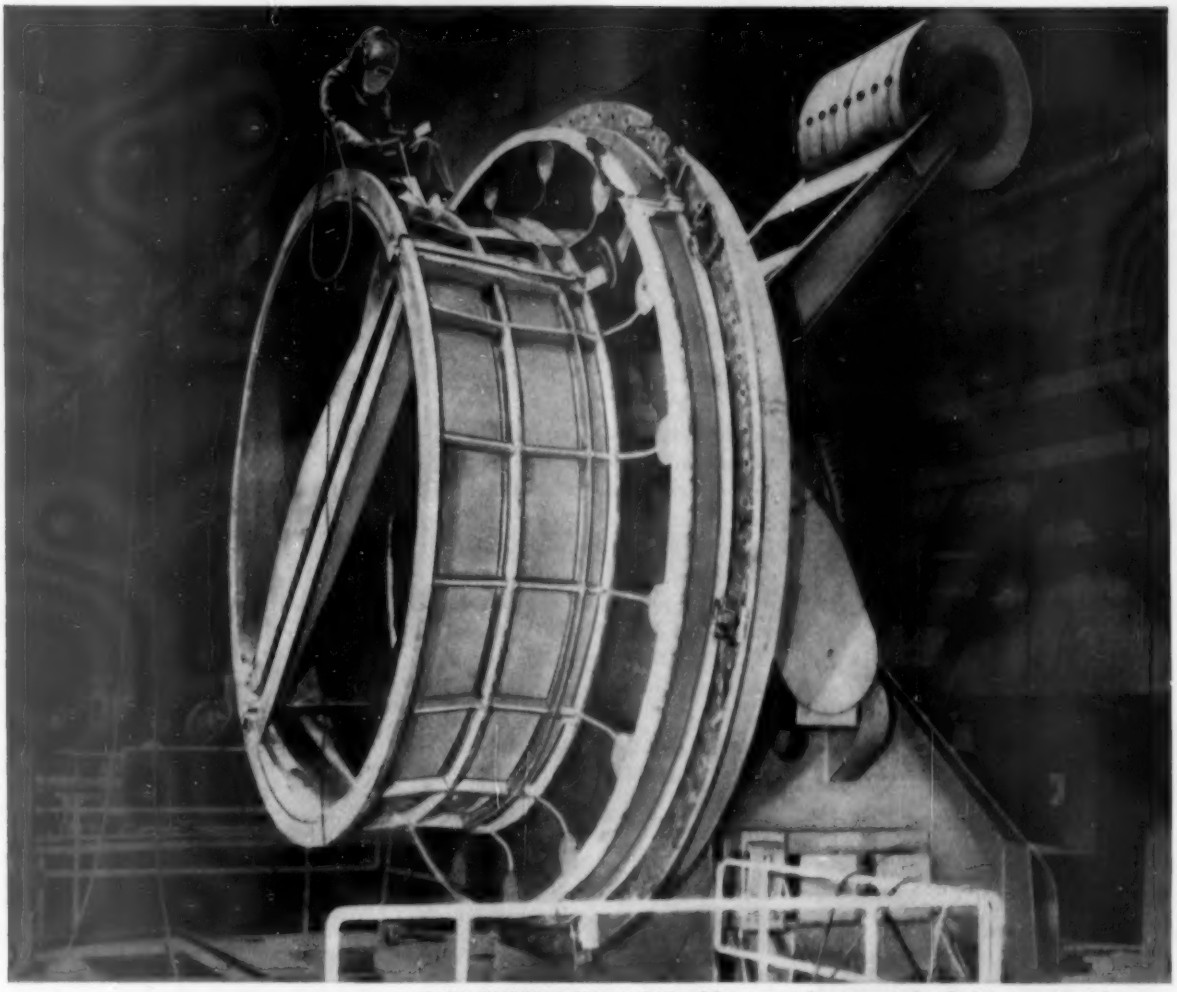
CONTOUR MARKER CORP. OF CALIFORNIA
1843 East Compton Boulevard, Compton, California

BOYCE CENTERING HEAD marks center line at any degree of angle on pipe, shaft, tube. Leveling gauge on dial.

24" RADIUS MARKER is folding compass of Dural aluminum. Folds to 9¼" pocket size; weighs 8 oz.

PIPE FLANGE ALIGNER expands and centers inside pipe to align flange for welding. For any pipe dia. 3" to 12"

THE *Original* CONTOUR MARKER
ACCURACY PROVED BY TEN YEARS OF SERVICE TO WELDERS



DOWNHAND WELDING of huge weldments at the S. Morgan Smith Co. is made easy by automatic Worthington welding positioner.

World's largest welding positioner

Handling 64,000-lb weldments was the problem facing engineers in the S. Morgan Smith Company plant in York, Pa.

Correct positioning of pieces this big would be exceptionally expensive if ordinary methods were used.

So this leading turbine manufacturer turned to Worthington for help — and got the world's largest welding positioner.

The extra capacity of this Worthington Model 600 Positioner (it's designed for loads up to 50 tons) is matched by many other Worthington "extras". Worthington's top-notch field service and creative engineering background are more reasons why the *important* positioning jobs — large and small — go to Worthington.

Write for Bulletin R1700S11 today. Worthington Corporation, Positioning Equipment Division, Harrison, N.J. Y-5.1

WORTHINGTON

Welding Positioners • Turning Rolls

Brazing with the low-temperature silver alloys EASY-FLO and SIL-FOS, supplemented by a fast heating method, and a set-up that promotes fast handling — that's the ABC of economical metal joining. An effective example is the job pictured, courtesy of Zatko Metal Products Co. of Euclid, Ohio, large-scale manufacturer of stamped one-piece pulleys.

❶ One girl slips pulleys onto shafts and applies HANDY FLUX. The other puts a ring of EASY-FLO 45 wire on top of each assembly.

❷ Assemblies with preplaced alloy rings, are put in fixtures which accurately position pulleys, and are brazed automatically by induction heating.

❸ Heating time for 2 assemblies is 25 seconds. Production per 8-hour shift is 1500. Assemblies are tested to 4000-lb. pull.

GET THE FULL *EASY-FLO* AND *SIL-FOS* STORY

It's all in the profusely illustrated BULLETIN 20 — including useful pointers about joint design and fast, low-cost production methods. Write for a copy today.

HANDY & HARMAN

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Virginia tunnel lining contract to Baldwin

Baldwin-Lima-Hamilton Corp., Eddystone Division, Philadelphia, has been awarded a contract to furnish 6,900 ft of double-wall steel casing for the underwater part of the new tunnel-bridge crossing at Hampton Roads, Va. The crossing will stretch some four miles across the Roads from Willoughby Spit, near Norfolk, on the south shore to a point near Hampton on the north shore. It is scheduled for completion late in 1957.

The sub-contract for the tunnel lining calls for twenty-three 300-ft sections. The outer, octagonal-shaped wall of each section will be 37 ft across flats, and the inner circular wall will have a 33-ft diameter.

These massive sections will be fabricated by Baldwin's Large-Weldment Department and then launched nearby into the Delaware River. From here they will be towed via the Delaware River, Delaware-Chesapeake Canal, Chesapeake Bay and Elizabeth River to a "shape-up" station at Lamberts Point, Norfolk, about five miles from the tunnel site. For this type tunnel construction, the sections will be lined with concrete, floated into position, sunk, and locked into place in a dredged trench.

Baldwin's Weldment Department will make special press dies and welding fixtures to form the steel plate and hold it in position for fabrication of the liner sections.

* * *

Huge metal-treating furnace begins operation

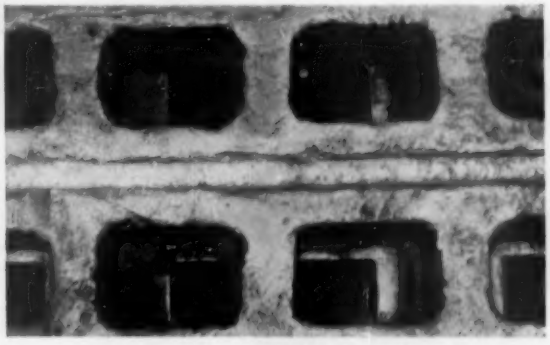
A new drop-bottom, metal-treating furnace, said to be the largest of its type, began operation recently at Metallurgical, Inc., Minneapolis. The furnace, especially designed by Loftus Engineering Corp. (to vertically heat treat extra long parts), hardens, anneals, stress relieves and normalizes steel and aluminum. Controlled endothermic or neutralene atmosphere is claimed to insure bright work and eliminate scaling.

Three chart-type recording instruments control the furnace temperature within plus or minus five degrees to 2,200 F. Distortion is kept to a minimum by vertical heating and then quenching in a 22-ft deep temperature-controlled, agitated salt bath. It has been found that the hot-salt quench reduces distortion up to 90% compared with conventional oil quench. Because of its ability to minimize distortion, the furnace is already handling large aircraft parts in production runs.

Easy Repair Welding—A bus company builds up worn valve seats of old engines with NI-ROD® electrodes. The company's maintenance chief says welding cast iron "heads" with NI-ROD is quick and easy. Cuts costs, too.

Valve Seat built up with NI-ROD is remachined. Then it's as good as new! Thanks to NI-ROD's operability it is easy to get *sound machinable welds in cast iron* . . . even for welders of limited experience.

Easy Production Welding—For a shake-out deck, a Michigan foundry joined heavy Ductile Iron sections with NI-ROD "55"® electrodes. The foundry welded Ductile Iron to itself and to steel framing with NI-ROD "55".



Here's a close-up of the NI-ROD "55" weld joint in the two main deck castings. *No preheat or postheat was used.* Yet the weld is crack-free, despite terrific battering . . . *proof you get sound welds easily with NI-ROD "55"!*

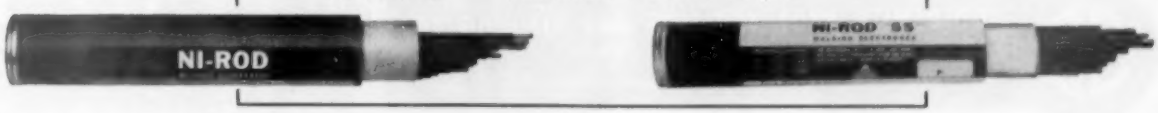
"Cast iron" proof that Ni-Rod is the easy way to weld cast irons

Try these companion nickel alloy electrodes. *Prove to yourself* how NI-ROD and NI-ROD "55" simplify *all* cast iron welding. Order a 5-lb. trial package from your supplier — 3/32-inch, 1/8-inch, 5/32-inch and 3/16-inch diameters.

And write Inco for the latest booklets on NI-ROD and NI-ROD "55". They will show you some of the many types of cast iron welding where these two electrodes prove so successful... help you decide which to use in a given job.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

INCO TRADE MARK **Welding Products**
Electrodes • Wires • Fluxes



NO MATTER WHAT METALS...
there's a GB silver brazing alloy and flux combination that will Speed Your Production!
SILVER
COPPER
BRASS
STAINLESS STEEL
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STEEL
NICKEL
CHROME ALLOYS
GOLD
TOOL STEEL
CARBIDE
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Every day more and more fabricators are learning that GB Silver Solder with GB Flux makes an unbeatable production team for low temperature brazing.
From the GB line of six standard silver solders you can select the one which will fully meet your production specifications. Yes, with GB Silver Solders you get sound, low-cost joints on virtually any ferrous or non-ferrous metal.
GB Standard Silver Solders:
GB No. 50 Silver Solder, melting range 1160-1175°F
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GB No. 45 Silver Solder, melting range 1125-1145°F
GB No. 41 Silver Solder, melting range 1125-1160°F
GB No. 35 Silver Solder, melting range 1130-1270°F
GB No. 31 Silver Solder, melting range 1130-1300°F
For special jobs where special silver solders are required, GB offers you competent technical assistance, backed by over 80 years of experience in alloying and refining precious metals.
GB FLUXES
The physical properties and appearance of a brazed joint are controlled to a large degree by the flux which is used. For this reason it will pay you to team-up GB Flux with GB Silver Solder — they were developed to produce maximum results when used together.
GB DATA BOOK
Here's real factual data on all of the important phases of low temperature brazing. You can get a free copy from your GB Distributor — Write us and a copy will be forwarded to you.
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Soviets prepare pipe for welding mechanically

TRIMMING and cutting of edges of pipe-section seams and steam-tank seams, before welding, is done by a newly developed machine in the Soviet Union. The new method, described in the Soviet magazine *Energetic*, employs a machine to smooth pipe seams to closest tolerance, in order to achieve straight seams before welding.

A lathe mechanism weighing 23.2 lb is pushed over a pipe section's end and there screwed tightly. A screw system automatically centers the pipe inside the cutting head. The tool consists of a circle gear at the free end of the head, where a side pinion is in mesh with the gear. The pinion is driven by a 1.2 kw motor of 900 rpm.

Pinion, drive shaft, and electric motor are mounted to a solid base. When turning on the engine, the pinion drive turns the circle gear by means of the pinion. Attached to the support of the stationary parts is a two-blade steel cutter etching off pipe material while the gear system rotates the pipe section. The first cutting steel is used for straight cutting, the second, the "phase cutter," is set at a 35 to 40-deg angle.

* * *

Pennsalt opens new chemical specialties plants

Pennsylvania Salt Mfg. Co., Philadelphia, recently opened a new plant at Delaware, Ohio. The plant, Pennsalt's 13th production facility, is a component of the firm's Chemical Specialties Division. A similar installation at Chicago Heights, Ill., was just completed.

* * *

Nelson Stud resumes western operations

The Nelson Stud Welding Division, Gregory Industries, Inc., Lorain, Ohio, has resumed limited stud manufacturing operations at its western regional headquarters in San Leandro, Calif. The move is intended for greater efficiency in filling orders for special studs not readily available in warehouse stocks.

* * *

New office of ASEE at Urbana, Ill.

The office of the American Society for Engineering Education has been moved to the University of Illinois. This was occasioned by the appointment of a new secretary, Professor W. Leighton Collins, whose address is: ASEE, University of Illinois, Urbana, Illinois.

Plastic resin compounds manufactured by new firm

Formation of a new company, The Permagile Corp. of America, New York City, to manufacture and sell new type plastic resin compounds, was announced recently by Dr. J. A. Neumann, president of the American Agile Corp., Cleveland, who will also head the new firm.

Other officers of the new concern include Theodore I. Leston, former vice-president in charge of research, development and production for Eutectic Welding Alloys Corp., who will serve as executive vice-president; and William B. Kriewall, former chief engineer of Eutectic, who will serve as vice-president in charge of production and development.

The corporation, with plants in Cleveland and Long Island, N.Y., will manufacture, distribute and sell the Permagile compounds, which are especially designed for sealing and welding many dissimilar non-metallic materials.

* * *

Babcock & Wilcox buys Milwaukee company

ASSETS and business of Globe Steel Tubes Co., Milwaukee, have been purchased by The Babcock & Wilcox Co., New York City. The former manufactures seamless and welded stainless, alloy and carbon-steel tubing as well as a variety of aircraft tubing, pressure tubing and welding fittings. The acquisition of Globe Steel will increase the range of products manufactured by B&W's Tubular Products Division. The Milwaukee plant will be operated as part of that Division.

* * *

Flies to Europe

—Photo courtesy Swissair

RENE D. Wasserman, president of Eutectic Welding Alloys Corp., is shown just before taking off for a recent flight to Europe

It's a cuttin' fool!

Light heavy-weight cutting torch *It's a* ***TRIPLE THREAT***

Look what this *NEW* Smith's Cutting Torch gives you:

It is brand NEW. It ingeniously combines more operating advantages than any you have ever seen. Trade tests to date have been sensational. Check these facts and write us today.

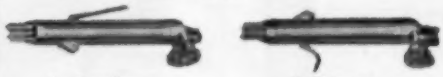
Does the work of a heavy-duty torch . . . but you should see how LIGHT it is—and easy to handle!

Cuts anything from tomato cans to 14" steel (using proper tips). Yet it's light-weight and perfectly balanced. A brute for performance but easy on the operator. We put into this torch what you and other operators asked for.

Slip-In-Tips—no wrenches needed.

Just slip the tip in, spin the nut with your fingers and you're ready to go. How could anything be easier? Try it yourself and see.

3 interchangeable controls—quick change from one to the other in less than 1 minute.



1. Over lever. *2. Trigger.* *3. Under lever as shown above.*

No matter what type of cutting jet control you prefer, you have it in this torch—and you can switch from one to the other any time you want. Adaptable to any personal likes or techniques. Reduces number of torches needed to accommodate all operators' requirements.

No slag . . . cuts clean.

The new Smith Tips with this torch give you clean, knife-line cuts with narrow kerf and almost complete absence of slag. Operator does not have to waste time cleaning up his cuts. Speeds up production. Want a demonstration?

Write today for complete details

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Visit our booth No. 323, Western Metal Congress & Exposition, March 28-April 1, Los Angeles

G-E using nylon liners for welding-wire transmission

Nylon tubing liners for transmitting welding wire have been adopted by the General Electric Co. for use in its inert-gas, shielded-arc process.

Use of the nylon tubing is said to be an innovation in welding equipment. It is suitable for the handling of aluminum, stainless steel, copper, nickel, magnesium, aluminum bronze and other weld metals.

Design of the equipment calls for a smooth casing inside of a flexible hose which can transmit the welding wire from coils to the gun. To insure an even feed, the hose or tubing has to be smooth, resist abrasion and have low friction against the welding wire. Moderate flexibility and resilience in the tubing are other important requirements.

—*The Polymer Corp.*

* * *

Largest metal-clad building to have stainless-steel skin

Stainless steel has been selected as the exterior sheathing for the world's largest metal-clad building—the Socony-Vacuum Building—now under construction in New York City. Galbreath Corp. owns the structure.

Approximately 750,000 lbs of 0.037-in. thick 18-8 chromium-nickel, Type 302 stainless steel will be used in the new 42-story office building. Components of the weather- and wind-tight sheathing include panels in the form of pier covers, spandrels, fully reversible windows, frames, mullions, and louvers.

Stainless steel will also be used for many other applications such as elevator cabs and doors and lobby trim.

* * *

Distributor appointments

Ampco Metal, Inc., Milwaukee: Brady Supply Corp., Elmira, N. Y.; C. D. Genter Co., Chattanooga; Gulf Welding Equipment Co., New Orleans; Keen Machinery Co., Cincinnati, O.; Ohio & Georgia Supply Co., Jacksonville, Fla.; Walter Pestrak, Cortland, Ohio; The St. Catharines Brass Works, Ltd., St. Catharines, Ontario, Canada.

Holcroft & Co., Detroit: William K. Duff & Co., Darien, Conn.

The Rotor Tool Co., Cleveland: The Olsen Co., Los Angeles.

Webster Electric, Racine, Wis.: Haskel Engineering Supply Co., Glendale, Calif.

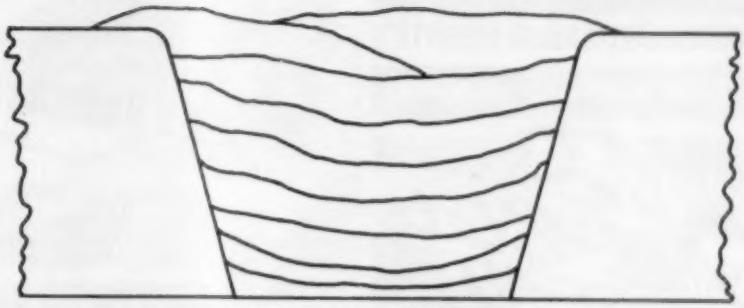
Filler metals for joining . . . . . from page 42

bols. Some day design engineers, probably a needed hybrid known as a "welding design engineer," will specify all details of the welding process and welding sequence for the shop.

Mechanical properties and operating characteristics are the principal tests for selecting electrodes, except for hydrogen evaluation in the low-hydrogen types. When butt welds of the type shown in Fig. 4 are made, passes must be a maximum 1/8 in. in thickness, and the boiling water preheat and interpass temperature control is necessary. Certainly no one uses boiling water in production. But it is a convenient way to obtain uniformity of results among different testing groups. Higher interpass temperatures usually increase ductility factors at the expense of yield and ultimate strengths. Also, smaller-diameter electrodes generally show a better balance of physical properties and soundness than do larger diameters.

Details on mechanical tests, positions of testing and the hydrogen test are available in the AWS-ASTM specification. Bead profile is tested for fillet welds, as is penetration. And applications and approvals are outlined in the appendix.

Generally speaking, all manufacturers produce electrodes that meet specification requirements. As a result, the cost of checking physical properties is usually unwarranted. Instead, effort might be directed towards applying the best class of electrodes to the most suitable joint. These relationships will be covered in subsequent articles.



4—TYPE of layers used for all weld metal tension test specimens

REFERENCES

[1] *Welding Handbook*, American Welding Society, Third Edition, 1950.

[2] *Tentative Specifications for Mild Steel Arc Welding Electrodes* (AWS Designation A5.1-48T—ASTM Designation A233-48T), June 7, 1948.

[3] *Standard for Arc Welding Electrode Identification, No. EW2-1954*, National Electrical Manufacturers Association, May, 1954.

[4] H. Lawrence, "Metallic Arc Welding Electrodes," *Steel*, v 114 n 10, 11, 12, 13, 14, 15, 16, 17, v 115 n 11, 12, 13, 14, 15, 16, 1943.

* * *

Spectrographers will meet in Chicago on May 6

THE American Association of Spectrographers is planning its 6th annual conference for May 6 in Chicago.

There's Exactly The Right

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to meet every welding requirement!

MILLER welds all metals *better*. Each machine in the complete MILLER line is designed to meet a particular requirement.

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steel castings
steel structural shapes

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SR Series. Provide unusually wide current ranges. May be used for both Metallic Arc and 'Heliarc' welding.

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Tool Steel
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High Carbon Steel
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Tensile Strength, 85,000 psi.
Shear Strength, 160,000 psi.
Elongation in 2", 12.0%
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Flows Like Silver Solder
Resists Wear 5 times Better Than Steel
Bonds at 1450 F.
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Finishes Jobs Faster

A LITTLE DOES A LOT MORE

No. 11 Costs Less Per Job
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No. 11 Saves Gases—Up To 50%
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WHITE PLAINS, N. Y.

Paul J. Krause has been elected vice-president of the recently incorporated Harruff Welding Corp., Toledo, Ohio. He formerly was manager of sales service for U. S. Steel Supply Division of U. S. Steel Corp. in Cleveland. The Harruff firm specializes in steel fabrication and leasing of equipment.

* * *

Donald E. Custance has been appointed assistant sales manager of Progressive Welder Sales Co., Detroit. He has been associated with the firm more than 15 years in various engineering and sales capacities.

* * *

L. O. Geiger, manager of the Dayton, Ohio, district of Air Reduction Sales Co., retired Jan. 1. He had been with Air Reduction 38 years and supervised sales activities in the Dayton area since 1927. *C. R. Grange*, assistant district manager, succeeds Mr. Geiger. Mr. Grange has been with the company since 1934 when he started as a student salesman.

* * *

Herbert B. Clark has been named executive vice-president of Fansteel Metallurgical Corp. and its subsidiaries, WW Alloys, Inc., Vascoloy-Ramet Corp., and Tantalum Defense Corp. He previously was president and general manager of Vascoloy-Ramet. Mr. Clark entered the Fansteel organization in 1939 as sales manager, later becoming vice-president. He has been a Fansteel director since 1951.

* * *

A. F. Davis, vice-president and secretary of The Lincoln Electric Co., Cleveland, has been appointed chairman of the trustees of Future Farmers of America Foundation. The committee represents some 230 businesses and industries interested in aiding young men become established as competent, independent farmers as well as leaders in their communities.

sellstrom safeguards designed for comfort

New "Snug" Fiber Glass Welding Helmet

No. 299—About ¾ Size Helmet

This is an entirely new Sellstrom helmet. It is a molded Fiber Glass helmet with round front, closed bottom construction. Instead of the standard 9 inch inside width, this "Snug" helmet is only 7¼" wide, yet large enough to accommodate prescription glasses with plenty of room for abundant air circulation.

Especially recommended for shipyards, bell hole work on pipe lines and wherever welders work in tight places. Now consider these additional advantages:

1. Five times stronger than ordinary fiber. Has no grain, therefore no weak spots. Withstands rough treatment.
2. Does not transmit heat; keeps welder cool. Will not absorb moisture; keeps shape indefinitely.
3. Smooth self-finish in new dark gray color. Does not show ordinary spots.
4. Equipped with new, improved Sel-O-Matic ratchet type headgear; has larger, stronger teeth. Easily repaired if necessary; adjustable to fit any head. Standard size Lift Front plate holder. Can also be furnished with, or is interchangeable with, any of the other Sellstrom headgears and plate holders.

Since this is an entirely new "Snug" (small size) welding helmet, ask your dealer to order one or more for you. You can also write us for additional information or request us to forward a sample No. 299 Helmet on memo for test purposes.

Your dealer should soon have a stock of this new "Snug" size Fiber Glass helmet and will be able to supply your regular requirements.

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Eye and Face Safeguards Designed for Utmost Comfort

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Swanson

Cummins

Wayne L. Cummins has been appointed district representative for the Dayton-Cincinnati area by Resistance Welder Corp., Bay City, Mich. *L. E. Swanson* has been named district representative for the St. Paul-Minneapolis area.

* * *

Albert P. Gagnebin has been appointed assistant manager of the Nickel Sales Dept. and *Edward B. Bitzer* assistant manager of the Nickel Alloys Dept. of The International Nickel Company, Inc., New York City. *Keith D. Millis* has been placed in charge of the Ductile Iron Section of the Development and Research Division.

* * *

Joseph C. Fox, long associated with The Doehler-Jarvis Corp. as chief metallurgist, has opened a new office in Toledo, Ohio, for consultation on matters pertaining to the chemical and metallurgical phases of the die-casting process.

* * *

Edwin E. McConnell was recently elected treasurer of Norton Co., Worcester, Mass., succeeding *William J. Magee,* who retired. *William H. Perks* was appointed controller to succeed Mr. McConnell. *Robert D. Lawson* was elected to the new position of vice-president and sales manager for the company's Grinding Machine Division. *Richard Prouty* became secretary of the company succeeding *Malcolm N. Pilsworth,* who retired. *Fairman C. Cowan* was elected clerk of the corporation succeeding Mr. Pilsworth. *George N. Jeppson* was re-elected chairman of the board and *Milton P. Higgins* was re-elected president.

* * *

James A. Wilson has been appointed plant manager of Kaiser Aluminum & Chemical Corp.'s Baton Rouge, La., alumina plant. *Ray Woodman,* who has been manager of operations at Baton Rouge during the plant expansion program this past year, will return to the Oakland, Calif., headquarters to assume duties as manager of the Raw Materials Division.

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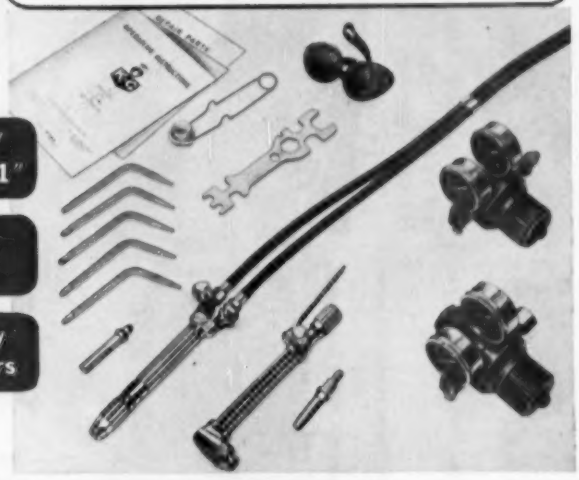
Cutting to 4" ...Welding to 1"

Quick, Easy Changeover

Revolutionary New Regulators



You get K-G's "All Purpose" AP Combination Welding & Cutting Torch with Monel head on both torch and cutting attachment, hand-tight seals, etc... easy-to-insert welding and cutting tips ... new single stage or two stage K-G Regulators with amazing performance, simplicity and life ... quality accessories. Also APM (Medium Duty) and APL (Light Duty) Outfits. Call your K-G Distributor, or write to *The K-G Equipment Co., Inc., Dept. A , 1744 Lehigh St., Allentown, Pa.*

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AN AIR REDUCTION PRODUCT

FOR WELDING AND CUTTING...

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STURDY CONSTRUCTION—Forged brass bodies, shatterproof gauges, dependable safety valves.

LOW COST—Replaceable, self-aligning seats; minimum of moving parts.

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Dockson CORPORATION 3339 WABASH • DETROIT 8, MICH.

Kriewall

Leston

Dr. Theodore I. Leston has been appointed executive vice-president of the Permagile Corp. of America, a new affiliate of the American Agile Corp., and *William B. Kriewall* is vice-president in charge of research, development and production. (See other story in news section of this issue.)

* * *

Robert E. Roediger has been appointed sales and service representative for the Birmingham, Ala., area by Hobart Brothers Co., Troy, Ohio. He will make his headquarters at 2657 Park Lane Court, East, under the name of Hobart Welding Supply Co. He will have full charge of servicing and distribution of a complete line of arc-welding equipment, supplies and electrodes.

* * *

John B. Dempsey, Detroit branch manager, has been appointed manager of electric tool sales of Thor Power Tool Co., Aurora, Ill. *Otto Shellenberger*, a Thor Detroit service engineer since 1951, has been appointed to succeed Mr. Dempsey as Detroit manager.

* * *

Diamond-studded gold lapel pins and certificates marking their 10 years as Eutectic district engineers were awarded recently to *Aaron Rupp* (Northern Michigan District) and *Richard Hillistad* (Western Iowa District) by *Rene D. Wasserman*, president of Eutectic Welding Alloys Corp., Flushing, N. Y.

* * *

William G. Gillett has been appointed works manager of the Culver City, Calif., plant of Merit Products, Inc., manufacturer of abrasive wheels. He comes to Merit from Ferguson Overhead Doors, Los Angeles, where he was superintendent of operations.

POSITIVE LOCK!

JUST LIKE THE

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CABLE CONNECTORS

- Exclusive Cam-Action!
- Locks Tight!
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- No Spring Action!
- Releases Easily!

Exclusive Cam-Lok design guarantees positive, vibration-proof connection. Locks tightly in about ½ turn. No spring tension, no weaving or moving of contact surfaces, therefore, no arcing, burning, or freezing.

COMPARE POSITIVE LOCK and these CAM-LOK features with your present connectors:

1. High Pressure contact eliminates overheating and current losses.
2. Connects instantly, all cables from #2 to 4/0 without adapters and without tools.
3. Self-compensating for wear, self-cleaning.
4. Fiber insulation pin, arcing impossible.

"QUICK-DISCONNECT" ELECTRODE HOLDERS

Obsolete all others!

Eliminate need for whips and whip end!

CHECK THESE FEATURES:

- Eliminates need for carrying whips.
- Holder plugs in quickly and easily to any cable merely by attaching holder handle to cable end.
- Less money tied up in cables.
- No electrician and no tools required to change holders.
- Holder and jaws insulated with tough, heat-resistant fibre glass.
- High pressure positive lock.
- Offset jaws eliminate rod bending.
- Offset holder permits burning rods to shorter stubs.
- Choice of offset or straight jaws.

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Walsh

Hohmann

George M. Hohmann, who for the past year has been manager of the Pacific Coast Division, Alloy Rods Co., has been named vice-president in charge of production for both plants, with headquarters at the company's main offices in York, Pa. *E. R. Walsh, III*, has been appointed vice-president in charge of sales and will be responsible for all marketing, sales and promotional activities. Mr. Walsh has served as general sales manager for the past three years. Both vice-presidencies are newly created posts.

* * *

Stewart J. Cort, vice-president, Steel Division, Bethlehem Steel Co., and a director of Bethlehem Steel Corp., recently became the first winner of the Benjamin F. Fairless Award. Presentation of the award was made at the annual banquet of the American Institute of Mining and Metallurgical Engineers held last month in Chicago. Acceptance of a fund from U. S. Steel Corp. for establishment of the award was announced by AIME last April. It is to be given annually in recognition of distinguished achievement in iron and steel production and metallurgy.

* * *

John Mordica and *Gene C. Edwards*, members of the Gilron Products Co. sales staff, will continue to service their respective accounts following consolidation of their organization with the Pennsylvania Salt Mfg. Co. As previously announced, assets of Gilron Products have been acquired by Pennsalt Chemicals and its organization is being integrated with the parent company's Metal Processing Dept.

* * *

John H. Hollomon, manager of the metallurgy department, General Electric Research Laboratory, Schenectady, N. Y., was chosen by the National Junior Chamber of Commerce as one of America's 10 outstanding young men of 1954. Dr. Hollomon was honored for his leadership in metallurgy and metallurgical research and for special service to his country in war and peace.

"It certainly is a relief to have fumes and heat removed while I'm welding. The Ruemelin Collector has great suction. It makes a day's work pleasanter!"

Ruemelin Fume Collector in operation.

Welding shops equipped with Ruemelin Fume Collectors are assured of a clean shop atmosphere. Noxious fumes, heat and smoke are eliminated at their source, thus improving working conditions, lessening fatigue and paving the way for increased plant production.

The Ruemelin Fume Collector hood can be instantly placed where needed anywhere in the booth welding area. No tedious adjustments necessary. Just pull the inlet hood to the welding position and you are ready to go.

Note the new spring-loaded counterbalance mechanism which makes Fume Collector much easier to handle. Ask for Bulletin 37-E illustrating this new feature.

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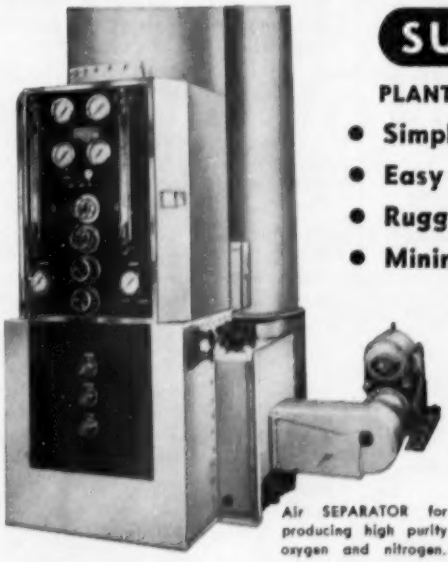

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For Brass, Bronze, Copper, Steel, Malleable Iron, etc. Causes the bronze to penetrate deeper into the joint—making a stronger union than is possible with other fluxes. High efficiency makes it more economical to use. Melting point 300°.

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Welders can save more money and get a better job on production work, making special tools, and repair work with the right Anti-Borax product—**order by number.** Send for **free sample** and descriptive circular.

ANTI-BORAX COMPOUND CO., Inc.
FORT WAYNE, INDIANA

John D. Russell, formerly manager of engineering, Joy Mfg. Co., has been appointed vice-president, engineering, with headquarters at Joy's executive offices in the Oliver Building, Pittsburgh.

* * *

Robert P. Gehring has been appointed sales manager of Cayuga Machine & Fabricating Co., Inc., Depew, N. Y. His responsibilities will be the application and sale of "Cayugamatic" automatic welding equipment and expansion of sales representation on a national scale. He formerly was with Westinghouse Electric Corp., and has 14 years of welding-sales and engineering experience. Mr. Gehring has been active in American Welding Society activities and is a past chairman of the Niagara Frontier Section.

* * *

Walter F. Comstock was named assistant manager of the Kansas City, Mo., sales district of Kaiser Aluminum & Chemical Sales, Inc., Oakland, Calif. He is succeeded as Kansas City district service manager by *Edward W. Wilson.*

* * *

Gilbert Lavoie has been named as sales engineer in charge of the newly established New York City sales office of J. C. Corrigan Co., Inc., Boston manufacturer of conveyors.

* * *

Michael P. Apostolik has become manager of Wheeling Steel Corp.'s New York District Sales office. He succeeds *Harold W. Schroeder*, who is retiring from active service after being with Wheeling for 39 years. Mr. Schroeder will remain with the corporation as a sales consultant.

* * *

William C. French Jr., has been appointed assistant manager of sales at the Chicago district office of National Tube Division, United States Steel's pipemaking division. Mr. French has been manager of sales at National Tube's St. Louis district office.

* * *

Spencer H. Mieras and *Kenneth W. Foust* were elected to fill vacancies on the board of directors of Bonney Forge & Tool Works, Allentown, Pa. Mr. Mieras was also elected executive vice-president.

1 TOOL LAYS OUT ANY ANGLE

on Any Size Pipe 1" to 60", and on Sheet Metal, Angle Iron, etc.

Use 1 **ANGLE METER** for cutting ANY finished angle. DIRECT READINGS (2 to 4); no math. Easiest, most accurate. Money-back guarantee.

3.50 in lots of 12

PRICES: 1 @ $5.00; 3 @ $4.50; 6 @ $4.00; 12 @ $3.50. 12"x12" overall. Specify FLAT; or FOLDING type for field.

Center Finder

Protractor with 6 Levels and 9" blade

5 tools in 1

Calibrated in steps of 1 degree and inches-per-ft.

Write for Bulletin CF, prices, and FREE 8 pg. BROCHURE on Pipe Layout.

10 WAY WRENCH $1

"QUICKER" fits hex nuts & bolts from 1/4" to 19/32" and 1/4" sq. PRICES: 1 @ $1; 6 @ 90c; 12 @ 85c.

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BRAZILIAN DEERSKIN THE "STAY SOFT" LEATHER GLOVES AND MITTENS

TILLMAN PRODUCTS
John Tillman & Co.
Long Beach, Calif.

Wilson A. Rohde has been named sales manager of The Reid-Avery Co., Inc., Baltimore, producer of arc-welding electrodes and welding rods. Mr. Rohde was formerly sales engineer, specializing in inert-arc welding. He is a member of the American Welding Society and has been associated with Reid-Avery for 10 years.

* * *

Robert M. Wilson, Jr., has been assigned to act as a development engineer in the power field for the Development and Research Division of The International Nickel Company, Inc., New York City.

* * *

Dr. Robert C. McMaster has assumed duties as a professor in the Department of Welding Engineering at Ohio State University. He had been a member of the staff at Battelle Memorial Institute, Columbus, Ohio, and has been associated with the research laboratory of the General Electric Co. and the Naval Ordnance laboratory in Washington, D. C. During World War II, Dr. McMaster supervised research in welding and X-ray non-destructive testing of aircraft materials. *William L. Green* has returned as an instructor in the same department. He had been on leave of absence with the U. S. Navy Air Force, Atlantic Fleet, since February 1953. He will be teaching and conducting research in welding design and arc metal transfer.

* * *

National Electric Welding Machines Co., Bay City, Mich., recently named the following officers for the coming year: *Edward C. Smith*, president; *William L. Mueller* and *Howard C. Cogan*, vice-presidents; *Charles E. Shearer*, secretary-treasurer, and *Norman A. Witzleben*, assistant secretary-treasurer. *Simon Fisher* has been appointed general manager and *Dean L. Knight* plant manager. Both had been assistant managers since April, 1954.

* * *

Harry Cotesworth has been advanced to chief engineer of the Development Department of The Cleveland Crane & Engineering Co., Wickliffe, Ohio, and *Kurt R. Weise* has been named chief engineer of the Cleveland Tramrail Division.

Truly Universal
Precision Dillon Tester may be used in TENSILE, COMPRESSION, TRANSVERSE or SHEAR testing with equal accuracy. Hand operated or motorized, will test any type material in flats, rounds or special shapes. Seven capacities from 0-250 lbs. up to 0-10,000 lbs. Fully portable. Has self-aligning grips, maximum hand, ball bearings. America's most popular low priced tester! 6 to 8 DAY DELIVERY. Write today for illustrated brochure.
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ENGINEERING SKILL AT ITS HIGHEST!
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PROLONG
PRODUCTIVE LIFE
of
WORN SHOVEL
and
DIPPER TEETH
MANGANAL
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11% - 13½% Manganese-Nickel Steel
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SEMI-AUTOMATIC
WELDING GANTRY

3-Way Adjustment of Welding Gun
Gun will fit a radiograph machine for straight-line welding
Complete unit mounted on casters for quick location to work

This specially designed gantry for semi-automatic welding units features a rapid, 3-dimensional adjustment of the welding gun. This gantry unit is designed for use on pipe fabrication and circumferential welds of any kind. The welding gun also attaches to the torch holder for use on a radiograph machine for straight-line welding.

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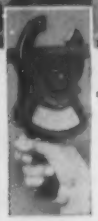

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New approach

Welding for Engineers. By Harry Udin, Edward R. Funk and John Wulff. Published by John Wiley & Sons, Inc., New York City, 1954. Cloth, 5½ by 8½ in., 430 pages. Price $7.50.

Welding for Engineers has an entirely new approach to the subject. While several books have been written in this general field, this one offers the reader a thorough appreciation of welding as an art and a science. Welding is treated as a field in itself, rather than as an offshoot of some other phase of engineering.

Some will find the authors' treatment difficult to comprehend, for the emphasis has been placed on principles rather than practice. For their theoretical treatment, they have drawn on principles of physics, mathematics, chemistry, metallurgy and mechanical engineering to construct a practical background that extends not only to welding and joining but to the other arts in the field of metal fabrication.

The sixteen chapters cover all welding processes. Wherever possible, an analytical approach is taken, making sure that the basic principles have been developed. Also included is a glossary of welding terms and problems.

Welding for Engineers is a must for engineers and a ready reference for those interested in welding theories. It is a refreshingly new approach to the subject.

* * *

Metallizing

Recommended Practices for Metallizing: Part IC—Application of Metallized Coatings to Protect Against Heat Corrosion. Published by American Welding Society, New York City, 1955. Paper, 6 by 9 in., 9 pages. Price 50 cents.

This is the third report in the general series on recommended practices for metallizing. The standard provides an authoritative source of information dealing with the application of metallizing as protection against heat corrosion for temperatures up to and over 1,800 F. Equipment requirements and methods of

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surface preparation are listed in detail. Metallizing procedures, including wire and sealer compositions and inspection tests, are also given, as well as typical coatings for specific applications.

* * *

Success story

Hugh Roy Cullen, A Story of American Opportunity. By Ed Kilman and Theon Wright. Published by Prentice-Hall, Inc., New York City, 1954. Cloth, 6 by 9 in., 376 pages. Price $4.

Usually the book reviews of this magazine are confined to technical subjects, but the story of the fabulous life of this Texas oil man who has given away more than $175,000,000 is so exciting and interesting that it can be included.

This is truly a saga of America; for no place else could a boy who spent his early years in the cotton fields take advantage of the opportunities presented by the land to become a giant in the business world—a giant little known to the general public but whose philanthropies have benefited many of his fellow men.

It is wonderful to read that there still are frank, rugged individuals who fight for their ideals as did our forefathers. This is good reading about an oil driller who shares his amazing adventures with you.

* * *

Metal failures

Mechanical Failures of Metals in Service. By John A. Bennett and G. Willard Quick. National Bureau of Standards Circular 550. Published by Government Printing Office, Washington 25, D. C., 1954. 30 cents.

For many years the Bureau of Standards has been requested to examine metal parts that have failed in service for evidence bearing on causes for such failures. Government agencies requesting such work include the Civil Aeronautics Board, Interstate Commerce Commission and the Coast Guard.

This circular describes 35 such cases representing the most frequently observed types of failures. Factors of design, fabrication, or use contributing to these failures are represented. The characteristics by which various types of fractures can be recognized are discussed, and recommended precautions that should be observed to reduce mechanical failures of metals in service are included.

The volume is well illustrated with photographs of failures cited along with photomicrographs showing sources of failure. Included are 102 figures and one table.

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30 YEARS AGO

(Taken from *The Welding Engineer* of March, 1925)

"THERMIT Welding Locomotive Frames," by R. P. Palmer, is the lead article in this issue.

—30 YEARS AGO—

STUART PLUMLEY, editor of *The Acetylene Journal,* recently returned to his desk after a long and severe illness which made it necessary for him to spend several weeks on the southern coast.

—30 YEARS AGO—

ENTITLED "A Hard One to Beat," the lead editorial in this issue tells how there exists among smaller users of welding processes the wrong attitude towards training of weldors.

—30 YEARS AGO—

SPECIALIZED training does not make men capable of doing diversified jobs —working knowledge of the entire art and more instruction is needed. The foregoing is the theme of an article in this issue by R. K. Randall, welding instructor at the Cleveland School of Technology.

—30 YEARS AGO—

W. H. JOYCE recently joined the Harris Calorific Co., Cleveland. He had been associated with Davis-Bournonville Co. for 16 years.

—30 YEARS AGO—

LIBBY Welding Co. has just completed a new brick-and-steel building to house its welding business. It is located at 115 Frelinghuysen Ave., Newark, N. J.

—30 YEARS AGO—

W. A. SLACK, president of Torchweld Equipment Co., has just returned to Chicago after an extended trip through the East.

—30 YEARS AGO—

THE Electric Arc Cutting and Welding Co., Newark, N. J., has announced the opening of its new branch office at Syracuse, N. Y., with William P. McCarthy in charge.

—30 YEARS AGO—

ALLAN Renton, of the Hawaiian Gas Co., Honolulu, is making a trip through the United States, visiting large welding installations and gas plants.

—30 YEARS AGO—

CARBIDE and Carbon Chemical Corp., Linde Air Products Co. and General Electric Co. will be represented at the coming Chemical Equipment Exposition in Providence, R. I.

The Inquiring Weldor

BY JOHN WILSON

Question: Have you been able to use "Eutectic Low Temperature Welding Alloys" successfully where you failed with other alloys?

Marvin Cutler, Dearborn, Mich. In motorcycle repair work, we very often find rear wheel chain sprockets with teeth broken off. Until I started using EutecRod 185FC, I had never been successful in finding an alloy that would hold up under the punishment that these sprockets take. With EutecRod 185FC, I can build up several teeth in a row showing only a slight redness in the metal. Then I grind the teeth to shape. The rebuilt gears outlast new ones, and cost a lot less than the replacement cost of $25 for new ones.

Question: What has been your experience with welding auto and truck springs?

Joseph Daddona, Waltham, Mass. Before I started using EutecTrodes, I tried to weld the main spring of a dump truck with another alloy. After being in use for two days, it snapped. On a similar job, I now vee out both sides of the leaf and use EutecTrode 680. It goes on at such low heat that the base metal is not affected. As a test, we tried to snap the welded leaf under a hydraulic press, but it stood up. "Low Amp" EutecTrodes have saved me and my customers lots of money, especially on cars and trucks for which parts are not carried in stock.

Question: Do you use many different "Eutectic Low Temperature Welding Alloys" in your work?

Louis A. Edwards, Flint, Mich. I own and operate a custom welding and saw repair shop. I use approximately 15 different EutecRods and EutecTrodes consistently with wonderful results. "Low Temp" EutecRod 16FC has been a big boost to my business in making difficult jobs easy. SteelTectic 81 works terrific for welding thin and dirty steels where ordinary electrodes would burn through. Eutectic "Low Heat Input" metal joining enables me to produce "Better, Faster, Cheaper" welding jobs.

Question: Have you ever solved an "impossible" job with Eutectic?

Albert F. Selby, Port Huron, Mich. Recently, EutecTrode 1850AC solved a virtually impossible job of welding a cast iron babbit bearing cap without melting the babbit. Another "impossible" job was to weld a large jack shaft on a paper baler. After all other methods failed, we found that only EutecTrode 680DC made a perfect job.

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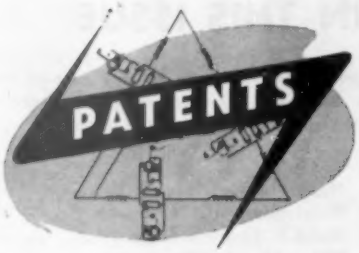

Ventilated goggles

2,667,640. GEORGE R. HOFFMASTER, Easterly, Pa. Assigned to Willson Products, Inc., Reading, Pa. Filed June 16, 1952. Granted Feb. 2, 1954.

This patent concerns a pair of goggles with lens-retaining eye cups that have flanged rim portions. The inner walls have substantially the same diameter as the lenses received and centered by them. Each of the rim portions has a ring-shaped portion projecting inwardly. Air-inlet openings are notched out of the rim portion outwardly beyond the circumference of the shoulder portion. Air-outlet openings are notched out from circumferentially spaced portions of the shoulder in staggered relationship with the air inlets. Cutout portions are notched from the outer surface of the shoulder at circumferentially spaced points and extend between, and overlap, the inlets and outlets. Air enters beyond the periphery of each lens, travels underneath the lens through a small arc and finally emerges through the outlet openings into the interior of the eye cup.

* * *

Flux

2,671,040. TUNIS L. HOLMES, Jersey City. Assigned to The M. W. Kellogg Co., Jersey City. Filed April 20, 1950. Granted March 2, 1954.

A metal-treating flux is covered by this patent. In operation, heat is generated by discharge of electric current from the end of an electrode through a gap submerged beneath the surface of a depth of flux. This flux consists essentially of 25 to 55% fluorspar, 35 to 65% alumina, 10 to 20% magnesia and small quantities of other materials that do not substantially modify the character of the flux. The fluorspar, alumina and magnesia are present as uncombined materials in the flux prior to the metal-treating operation.

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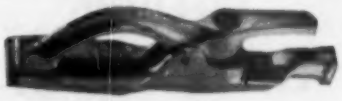

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Air Reduction Sales Co. 64-65
Allen Co., L. B. 98
Alloy Rods Company 77
All-State Welding Alloys Co., Inc. 88
American Brass Co. 55
American Manganese Steel Div. 58-59
American Optical Company 15
Ampco Metal, Inc. 11
Anti-Borax Compound Co. 92
Automatic Welding Co. 94

Belden Mfg. Co. ..... Inside Front Cover
Bridgeport Brass Co. 10
Burdett Oxygen Co., The 48

Cam-Lok Division of Empire Products, Inc. 90
Carborundum Company, The 16-17
Chicago Boiler Company 94
Chicago Eye Shield Company 2
Colonial Abrasive Products Co. 57
Columbia Electric Mfg. Co. 94
Contour Marker Corp. 80
Crucible Steel Co. of America 8

Dillon & Co., Inc., W. C. 93
Dockson Corp. 90
Drawalloy Corp. 97

Eastman Kodak Company, X-Ray Division 63
Engwald Corporation 92
Erico Products, Inc. 9
Eutectic Welding Alloys Corp. 96

Federal Machine and Welder Company 68
Fibre-Metal Products Co. 45

General Electric Company 70-71
Goldsmith Bros. Smelting & Refining Company 84

Handy & Harman 92
Harnischfeger Corp. 14
Harris Califorie Co., The 12
Harrisburg Steel Corp. 59
Haynes Stellite Co., Div. of Union Carbide & Carbon Corp. 18
Hewitt-Robins, Inc. 4
Hobart Bros. Company 1

International Nickel Co., Inc. 83
Interstate Sales Co. 92

Jackson Products ..... Front Cover

Kasson Die & Motor Corp. 62
K-G Equipment Co., Inc. 89

Lincoln Electric Co., The 20
Lindberg Engineering Company 75
Linde Air Products Co., A Div. of Union Carbide & Carbon Corp. 73
Liquid Carbonic Corporation 78

Mallory & Co., Inc., P. R. 53
Metal Bond Mfg. Company 94
Metal & Thermit Corp. 79
Miller Electric Mfg. Co. 71

National Carbide Corp. 89
National Cylinder Gas Corp. 47
National Welding Equipment Co. 7
Norris-Thermador Corp. 60

Page Steel & Wire Division 60-61

Rankin Mfg. Company 95
Reid-Avery Company, Inc. 13
Ruemelin Mfg. Company 91

Sellstrom Mfg. Company 88
Smith & Sons, G. W. 95
Smith, Corp., A. O. ..... Back Cover, 66-67
Smith Welding Equipment Co. 85
Stulz-Sickles Company 93
Superior Air Products Co. 91
Sylvania Electric Products ..... Inside Back Cover

Taylor-Winfield Corp. 74
Tempil Corp. 86
Tillman Co., John 92
Titan Metal Mfg. Co. 19
Torit Mfg. Company 65

Union Carbide & Carbon Corp., Haynes Stellite Company 69
Union Carbide & Carbon Corp., Linde Air Products Company 73
Unique Turn Table Co. 51
United Wire & Supply Corp. 76

Victor Equipment Corp. 22

Wagner Mfg. Company 97
Weldrod Company 98
Westinghouse Electric Corp. 69
Worthington Corporation 81

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12. WELDER—The Lincoln Electric Co. 8-page Bulletin 1343 describes the "Idealarc" welder for a-c or d-c applications.

13. CLAMPS—Wetzler Clamp Co. Booklet describes complete line of "Quick-Action" clamps.

14. RESISTANCE WELDING—P. R. Mallory & Co., Inc. 75-page booklet has complete information on electrodes, holders, dies and alloy materials for resistance welding.

15. BRAZING—Handy & Harman. No. 67 of "Brazing News" gives uses of "Easy-Flo" and "Sil-Fos" brazing alloys.

16. CABLE CONNECTIONS—Erico Products, Inc. 4-page folder tells of "Cadweld" applications in welding copper to copper or copper to steel with no outside heat.

17. ELECTRODE HOLDER—The Steil Co. New features of the improved "Detroit" electrode holder are listed in this leaflet.

18. TOGGLE CLAMPS—Detroit Stamping Co. Bulletin describes three new "trigger-release" portable plier-type toggle clamps.

19. BRAZING ALLOYS—Air Reduction Sales Co. "Aircosil Brazing Booklet" describes new line of silver-brazing alloys and fluxes for all production jobs.

20. STAINLESS TUBING — Carpenter Steel Co. 36-page catalog describes 11 types of fabrication of stainless tubing and pipe.

21. FLEXIBLE-SHAFT MACHINES—Franklin Balmar Corp. Catalog C-210 presents tabular data on three basic types of flexible-shaft machines.

22. HARDNESS TESTER — Steel City Testing Machines, Inc. Illustrated Bulletin KE 1154 depicts new "Color-Glance" Brindell hardness tester.

23. WELDING—Eutectic Welding Alloys Corp. Folder TIS 2328 gives tips on better ways of welding with low temperature alloys.

24. COPPER ALLOYS — The American Brass Co. 24-page reference manual B-34 R contains latest copper and copper-alloy specifications.

25. WELDING NEWS—Ampco Metal, Inc. Fourth quarter issue of *Ampco Welding News* contains articles on overlay of gears and bearing surfaces.

26. HARDFACING DEPOSITS—The Lincoln Electric Co. Reprint of report to American Welding Society treats fully the effect of deposit analysis and cooling rate on hardfacing deposits.

27. WELDING DATA—Hobart Brothers Co. 16-page booklet, Vol. XI No. 4 of *Hobart Arc Welding News*, includes many articles that feature time-and money-saving applications.

28. CARBON DIOXIDE—The Liquid Carbonic Corp. Booklet entitled "CO_2: Applications Unlimited" describes many uses of carbon dioxide in industry.

29. REFRACTORIES—The Carborundum Co. 24-page booklet contains easily located data on latest properties of super refractories.

30. SOLDERING OVEN—Electrical Industries. Catalog sheet illustrates and gives details on new soldering oven.

31. TEMPERATURE INDICATOR—Tempil Corp. Revised edition of "Instructions for Using Tempilaq," a liquid temperature indicator, is available.

32. VENTILATION—Dravo Corp. Brochure of engineering case studies describes eight solutions of plant ventilation using warm-air space heaters.

33. INDUSTRIAL EQUIPMENT — Harnischfeger Corp. New picture bulletin G-15, "A Great Hand to Help You Cut Costs," gives essential facts about "P&H" products.

34. FLASH-BUTT WELDER—The Taylor-Winfield Corp. No. 5411 of "Weld-It" describes in detail aircraft industry's largest flash-butt welder.

35. METAL TECHNIQUES—A. O. Smith Corp. 26-page brochure gives in detail four unique manufacturing processes making optimum use of metal.

36. CARBIDES—Carboloy Dept. 24-page booklet, section 3A, "Selection of Carboloy Grades and Suggested Speeds," gives useful aids in selection of cemented carbides for cutting.

37. STAINLESS PIPING—The Babcock & Wilcox Co. Bulletin TB 356 outlines methods of bending and joining stainless pipe and discusses problem of light wall versus heavy wall pipe.

38. POSITIONER — Cayuga Machine & Fabricating Co., Inc. Bulletin No. 5306 contains illustration and specifications of the "Cayuga-Matic" positioner for fingertip controlled welding.

39. BRAZING—Salkover Metal Processing of Illinois, Inc. Illustrated pamphlet gives ways of cutting cost in brazing operations.

40. MOISTURE TESTER—Weldrod Co. Data sheet describes device that determines amount of moisture in coatings of stainless, non-ferrous and low-hydrogen electrodes.

41. TOOL ATTACHMENT—Little Beaver Industries Inc. Pamphlet describes "Hefty Holer," compact heavy-duty tool attachment for portable electric drills.

42. PIPE FOR PILING—Taylor Forge & Pipe Works. Bulletin 542 describes characteristics of Taylor pipe and illustrates its applications in bridge and building construction.

43. WELDING-HOSE REEL—United Specialty Corp. Leaflet entitled "Is Safety in Your Plant Worth Three Minutes?" tells of handy reel for storing welding hose.

44. TURNTABLES — Eisler Engineering Co., Inc. Catalog No. 88-55 describes turntables, variable speed controls, cams, gears and special machines made to order.

45. WELDING ELECTRODES—Harnischfeger Corp. Pocket-size booklet describes shielded-arc electrodes for welding mild steel, cast iron, alloy steels, stainless and for hardfacing.

46. PORTABLE TOOLS—Skil Corp. 50-page illustrated catalog lists tools and accessories, including sanders, grinders, etc.

47. CLAMPS—Grand Specialties Co. Sheet lists complete line of *C* clamps, their uses, capacities, etc.

48. BLAST CLEANER—Vacu-Blast Co., Inc. 4-page specification sheet A-1 describes the "Vacu-Blaster" which blast cleans welds, re-uses abrasive and removes debris.

WELDING INFO-AIDS

USE THIS CARD for Literature, Catalogs, and bulletins shown on facing page, and for those featured in this month's ads as listed on next page

Also information about

NEW PRODUCTS described on pages 54 to 78

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literature offered in advertisements in this issue:

7. Bulletin on "Tong Test" ammeters for use on both a-c and d-c—Columbia Electric Mfg. Co.
101. Booklets on the use of "Ni-Rod" and "Ni-Rod 55" in cast iron welding—The International Nickel Co., Inc.
102. Bulletins on boosting production and cutting costs—Harnischfeger Corp.
103. Data book on all important phases of low-temperature brazing—Goldsmith Bros. Smelting and Refining Co.
104. Information on weldor's goggles and names of equipment distributors—Chicago Eye Shield Co.
105. Booklet on "Grindaway" wheels with safety rings—Colonial Abrasive Products Company.
106. Brochure on "ZIP-27" electrodes and samples of "ZIP-27" rod—Westinghouse Electric Corp.
107. "How to Get Better Welds"—Hobart Brothers Co.
108. Descriptive information on wire for rods, electrodes, automatic welding and metal spray—Page Steel and Wire Division.
109. Resistance welding catalog—P. R. Mallory & Co., Inc.
110. Story on "Atom-Arc" iron-powder, low-hydrogen electrode—Alloy Rods Co.
111. Illustrated brochure, 44 pages, on regulators, reduction, oxygen, etc.—National Welding Equipment Co.
112. Bulletin on welding positioners—Worthington Corp.
113. Facts on "Twin-Weld" hose, Bulletin No. H-4a—Hewitt-Robins, Inc.
114. "Hastelloy Alloy C—A Machinable Hard-Facing Alloy"—Haynes Stellite Co.
115. Booklets on "MX" abrasive products and "Carboflex" depressed center wheels—The Carborundum Co.
116. Folder on welding rod compositions and uses—Titan Metal Mfg. Co.
117. Catalog on electrode holders and cable connection equipment—Erico Products, Inc.
118. "Phoson" folder for brazing pressure pipe—United Wire & Supply Corp.
119. Bulletin 20 on "Easy-Flo" and "Sil-Foe" with information on joint design and low-cost production methods—Handy & Harman.
120. Brochure on new metal office furniture fabricated by resistance welding—The Federal Machine and Welder Co.
121. Information on light, heavy-duty torch—Smith Welding Equipment Corp.
122. Complete-line catalogs on gas and arc-welding equipment and supplies—The Liquid Corbonic Corp.
123. Catalog W-17 on wear-resistant overlays—Ampco Metal, Inc.
124. Illustrated acetylene-cylinder specification sheets—Norris-Thermador Corp.
125. Bulletin 1343 shows how to cut welding costs with a-c and d-c welding current in single machine—The Lincoln Electric Company.
126. Information on saving money by repointing worn teeth with "Manganal" wedge bars—Stulz-Sickles Co.
127. Illustrated brochure on tensile tester for any type of material—W. C. Dillon & Co., Inc.
128. Complete information and prices on welding wire—Drawalloy Corp.
129. Bulletin 37-E illustrates how spring-loaded counterbalance mechanism in "Fume Collector" makes it easier to handle—Ruemelin Mfg. Co.
130. Complete application instructions for "No. 11" nickel-silver brazing rod—All-State Welding Alloys Co., Inc.
131. Complete catalog of welding and cutting equipment—Dockson Corp.
132. Descriptive circular and sample of "No. 2" brazing flux—Anti-Borax Compound Co., Inc.
133. Catalog on soldering and welding products—Metal Bound Mfg. Co.
134. Bulletin on "Center Finder" and brouchure on pipe layout—Interstate Sales Company.
135. Information on gantry for semi-automatic welding units—Automatic Welding Company.
136. Catalog on welding gloves and garments—Tillman Products.
137. Booklet (24 pages) discussing "Aircosil" silver brazing products—Air Reduction Sales Co.
138. Catalog giving analyses, metallurgical information and other complete-line data on hardfacing alloys—American Manganese Steel Division.
139. Oxygen cylinder catalog and prices—Harrisburg Steel Corp.
140. Information on portable "Beaver" cutting machine—The Burdette Oxygen Co.
141. Money-saving story in booklet "Braze Welding Alloys"—Bridgeport Brass Co.
142. Application data on "Weld-O-Vent" welding fume exhausters—Engwald Corp.

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Do you have an INERT GAS welding problem?

Here are some tips that can save you money!

There's a right Sylvania Tungsten Electrode for every inert gas welding job . . . and a right technique for using the preferred electrode. The following welding helps are the result of field surveys and investigations by the research engineering staff of Rensselaer Polytechnic Institute, and Sylvania Electric Products, Inc.

A. C. WELDING

Metals Welded: Aluminum and magnesium are the metals most frequently welded with alternating current.

Tungsten Electrode: For the usual range of welding applications, Sylvania Zirtung electrodes will give the most dependable and the best performance. Under certain special conditions, Sylvania Thoriated Tungsten and Puretung Electrodes can be used acceptably.

If you have trouble with these problems . . . use these tips . . .

Difficult Starting	Clean work material thoroughly Use superimposed high frequency
Brittle Electrode Tips	Use larger size electrode
Excessive Heat in Electrode or Holder	Use larger size electrode Use centerless ground finish in larger size electrode
Freezing to Workpiece	Try longer arc Use a larger size electrode
Poor Penetration	Use higher current Try helium or a mixture of helium-argon

D. C. WELDING

Metals Welded: Stainless steel, inconel, monel and other similar metals.

Tungsten Electrode: For the usual range of welding applications, Sylvania THORIATED TUNGSTEN electrodes will give the most dependable and best performance. Under certain specialized conditions, Sylvania Zirtung and Puretung Electrodes can be used acceptably.

If you have trouble with these problems . . . use these tips . . .

Difficult Starting or Low Voltages	Point the electrode Try touch starting Use argon instead of helium Start fillets with filler rod (if permissible)
Brittle Electrode Tips	Point the electrode Use a larger size electrode
Excessive Heat in Electrode or Holder	Point the electrode Use a larger size electrode Use centerless ground finish in larger size electrode
Metal Pickup, Contamination of Electrode Tip, Erratic Arcs	Use a larger size electrode Use argon instead of helium
Poor Penetration	Use higher current Try Sylvania Zirtung Try helium or helium-argon mixes
Imprecise Welding (especially on fillets or tight corners)	Point the electrode Use starting block
Eroded Electrode	Use a larger size electrode Point the electrode Use a longer arc

Sylvania offers 3 high-quality Tungsten Electrodes

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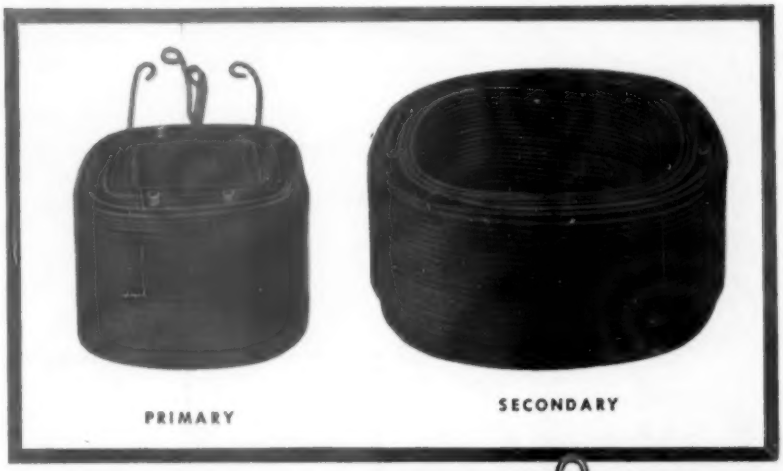
When buying a welder, find out for sure how much copper is in the transformer coils . . . that's the heart of a welder's performance.

For example, in A. O. Smith's 400-amp heavy-duty a-c welder, the coils contain 156 lbs. of high-quality electrical grade copper — 63 lbs. in the primary coil, 93 lbs. in the secondary. This is far more copper than you'll find in any comparable welder.



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